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THEODOR BILLROTH, MUSICAL AND SURGICAL PHILOSOPHER. A BIOGRAPHY AND A REVIEW OF HIS WORK ON PSYCHO-PHYSIOLOGICAL APHORISMS ON MUSIC.[1]

BY JOHN C. HEMMETER, M. D., PH. D.,

Professor in the University of Maryland.

In the following paper I have attempted a sketch of the life and work of a man who represents one of the most scholarly, versatile and inspiring characters in the history of German medicine; an investigator who accomplished and perfected achievements of enduring excellence in two arts, widely divergent—Music and Surgery; or, to state it in broader terms, in Biology and Medicine as well as in the Psychology of Music. For facts here narrated I have drawn largely from the various obituary notices and necrologies in German journals, and, for the second portion, from the introductory chapters to Billroth's book entitled "Wer ist musikalisch?" or "Psycho-Physiologische Aphorismen über die Musik."

BIOGRAPHY.

Christian Albert Theodor Billroth was born on the 26th day of April, 1829, in Bergen, on the beautiful island of Rügen. Here, in the midst of a happy family, and subjected to various intellectual influences, he spent his youth. After leaving the gymnasium he studied at the universities of Greifswald, Göttingen and Berlin, and in 1852 received the degree of Doctor of Medicine at the last-named institution. His graduating thesis on this occasion was entitled "De natura et causa pulmonum affectionis, quæ nervo utroque vago dissecto exoritur," (Concerning the nature and cause of a pulmonary affection which arises from section of the vagus). It was thought to possess unusual merit at that time.

Billroth had become so conversant with all branches of medicine during his university studies under such men as Rudolf Wagner, Johannes Müller, Lotze, Schönheim and von Graefe, that even after he had been persuaded by von Baum and B. Langenbeck to devote himself to surgery, he did excellent work not only within the limits of his own specialty, but also in normal and pathological histology, physiology, and general pathology.

To broaden his views he journeyed to Vienna and Paris,

[1] Read before the Johns Hopkins Hospital Historical Club.

and spent some time at the universities of both places. In 1853 he received an appointment as assistant to B. Langenbeck at the Royal Clinic of the Berlin University.

Under this great master, he very soon acquired the art of operating. His extraordinary skill in this direction and ability to rapidly comprehend the surrounding conditions of a case, together with his decision and steadiness of character, proved to be of the greatest importance to him.

In 1856 he was already doing good work as Privat-Docent at the Berlin University, and a few years later he had come to be regarded as the most prominent of the younger surgeons of Germany, not only with respect to his operative activity, but also on account of his work as an investigator.

In 1860 he received a call as chief professor and director of the surgical clinic in the University of Zürich. This position at once afforded him that independence of action that was befitting him. Whereas in Berlin he had to attend to the diagnosis and treatment of disorders following surgical operations, and could only satisfy his innate yearning for original investigations by a historical and histological study of the rich material afforded by the clinic, he now, through a continuous study of the sick, could open up paths of his own. His most important investigations at that time dealt with septic fever and accidental wound infections. These studies which he afterwards continued in conjunction with his friend Weber and later on at Vienna, effected a complete revolution of thought with respect to the causes and nature of these conditions.

His "General Surgical Pathology and Therapeutics," the first edition of which appeared in 1863, showed him to be an accomplished teacher, who had illuminated with new ideas the entire field of surgical pathology and therapeutics. The work defined sharply the limits of knowledge on the subject and incited many others to independent critical study. Written in a most attractive and fluent style, it soon displaced all contemporaneous works and appeared, at short intervals, in many editions; even to the present day its attractiveness is undiminished. The publication of the ninth and succeeding editions was entrusted by Billroth to his pupil, A. von Winiwarter.

The best evidence of the great success of this work is the fact that it has been translated into the French, English, Italian, Spanish, Hungarian, Polish, Russian, Servian, Croatian, and Japanese languages.

Billroth contributed, moreover, a number of important articles relating to various branches of surgery, to the Archives of Clinical Surgery, the editorship of which he had shared with Gurlt ever since its foundation in 1860 by B. Langenbeck. He also stimulated his Zürich pupils to many investigations of importance.

When at the death of Schuh the second chair for surgery became vacant, Billroth received a call to Vienna from the Medical Faculty, upon the determining vote of Rokitansky, Brücke, Skoda, Oppolzer and Hebra.

At the very height of his activity, handsome in appearance, and in the fullness of his vigor, he accepted the chair, August 20, 1867. Nor was it without difficulty that he finally succeeded in organizing his clinic somewhat according to his own notions, and the most necessary buildings and hygienic arrangements, as well as other indispensable improvements, were accorded to him only step by step. So great indeed was the opposition, outspoken and covert, with which he had again and again to contend, that even to the last he did not succeed in obtaining, as he had long hoped he would, either an up-to-date clinic with modern equipments, or a remodeling of the entire hall, as planned by himself.

In one respect he could claim a quick and decisive victory. The enthusiasm and love of those who attended his lectures, and the reverence and admiration of his more intimate pupils were his from the beginning to the end.

A fascinating delivery, coupled with great fluency of speech, and freedom from all doctrinal tenets, attracted everyone about him. Ideas and views quite new to his pupils were developed, and pathological phenomena, as they appeared at the sick bed, were explained in the light of the latest physiological, pathological-anatomical, and experimental-pathological discoveries. The soul of science breathed life into his teachings; the love of truth, with which Billroth was completely saturated, made them real. Here in his new sphere of duty, he inaugurated that restless activity which made him a captive for his last twenty-seven years at the Vienna institution.

"Per aspera ad astra," and "Durch Klarheit zur Wahrheit," these were the standards under which he unfalteringly moved on from victory to victory.

Perhaps his greatest contribution belongs to the domain of practical surgery. Hardly had he arrived in Vienna, when he began to compile his report on the Surgical Clinic in Zürich, from 1860-1867, which was followed by one on the Vienna Surgical Clinic from 1869-1870, and finally a report on the latter clinic from 1871-1876, together with another on both conjointly. The value of these volumes, which could only have been collated at the expenditure of the greatest of industry and through an almost infinite capacity for work, is due not merely to the important contributions to practical surgery contained in them, but much more to the fact that Billroth for the first time presented to the world a complete account of his entire experience.

Collections of statistics on various subjects belonging to medicine and even surgery had existed ere this, but no one before Billroth had had the courage to appear before the tribunal of scientific criticism with his experience in its entirety, including, therefore, that of an unsuccessful, as well as that of a successful character. In this way he stimulated others, and caused them to do likewise. The generally accepted opinion of to-day is that this manner of utilizing the statistical method in surgery is the correct one.

The stirring events of the year 1870 carried Billroth along with them. He felt it his duty to proffer his assistance, and he did so generously, both at Weissenburg and Mannheim. His scientific contributions to the surgery of the Franco-Prussian War are to be found in the magnificent letters re-

ceived from him while at the hospitals for the wounded, which form the worthiest monument of Billroth's activity as a military surgeon.

No sooner had he returned from the field hospitals than he resumed his extended investigations concerning the vegetative forms of septic cocci.

At the close of the year 1874 he was in a position to present to the wonderment of the scientific profession the results of his experience in the form of a monograph.

The wealth of observational data stored up in it, and the manifold points of view from which he attempted to master numerous problems which had presented themselves during the course of his investigations, together with those magnificent ideas which acted as the precursors of demonstrable facts, bear witness to that stupendous and ingenious spirit of investigation which impelled Billroth onward with unmerciful force, and caused him to make good use of well-nigh the last minute of his rather scantily portioned existence. Many and many a night he would remain till late at the microscope and study his specimens. During this period of time, as we learn from Gussenbauer (Necrolog über Billroth), Billroth worked for months at a time from 16 to 18 hours a day.

Hardly had he finished this stupendous task, when he undertook an investigation in a direction apparently remote from his immediate profession. He gathered information concerning the arrangement and character of medical studies prevalent at the universities of all countries. He took an interest in this subject as no one had done before him. The outcome of his study was a book, "How to teach and study the medical sciences." It created a sensation at the time being, particularly in Austria. It aroused much opposition on account of the plain truths which Billroth unhesitatingly and without heed of possible consequences had expressed in it. Although many of his opinions may be now considered as rather too rigid, his book is still, and will remain for some time to come, a veritable treasure-house of the grandest ideas. His views have been accepted as the most practical dealing with the organization of medical instruction.

Over and above this activity—so extensive as to have alone furnished ample employment to even an exceptional mind during a lifetime—he wrote a long series of essays and papers in which he clearly defines his position with respect to everything of an important nature evolved within the department of surgery and pathology during the course of many years.

His monographs on wounds and their treatment, on scrofula and tuberculosis, and on diseases of the mammary gland, contained in the joint treatise on surgery by von Pitha and Billroth and in Die Deutsche Chirurgie, are graphic models of lasting value, and everywhere mark the expert clinician and physician.

His historical and critical studies on matters relating to the transportation of the sick and wounded, on nursing as practiced at home and in the hospital, show the lively interest he took in everything which was intimately connected with the cure of his patients.

Even during the last years of his life, when illness began to annoy him, with constantly increasing intensity, he managed to keep himself thoroughly informed on all new discoveries in the spheres of surgery and pathology, and enlarged and supplemented them out of the rich fund of his own experience.

Many an idea which he has embodied in his treatise on the "Reciprocal Influence of Living Plant and Animal Cells," published in 1890, may be expected after thorough investigation to develop into facts of lasting utility.

At the inauguration of the Building of the Royal and Imperial Society of Physicians, Billroth made use of the occasion to summarize his entire experience on the treatment of aneurisms, and discuss the relative values of the various methods suggested.

Over and above all his very numerous publications, which show Billroth to have been one of the most productive and influential medical authors of the present century, he took upon himself an immense amount of the work involved in the editing of the Treatise on Surgery by Pitha-Billroth, of Die Deutsche Chirurgie by Billroth-Lücke, of the Archives of Clinical Surgery by von Langenbeck.

From Gussenbauer[2] we learn of still another treasure which Billroth has stored up in the course of decades. This work has not as yet been made public; only those who attended his lectures and his intimate pupils have had from time to time an opportunity to get a look at it, and appreciate what Billroth was doing in behalf of science at the cost of immense labor and a large expenditure of his own money.

I have reference to his collection of illustrations of diseases of rare occurrence, executed under his direction by celebrated artists. His long-conceived plan had been to incorporate this collection in a comprehensive work on special surgical pathology. It was not his good fortune to carry out this magnificent idea. His bodily powers did not suffice towards the end to keep pace with the onward movement of his indomitable intellect.

And what did not Billroth accomplish as an operator! Unequaled on the technical side of his art, and urged on by the noblest sympathy with the sick to help where others had failed to do so, he strove to extend the boundaries of practical surgery, and succeeded as no one before him had done.

Experimental studies on animals were first carried out, and not until the results of these, supported by all existing knowledge of the human body made the final outcome of the well-conceived operation promise more than a probability of success, did he proceed to the rescue of the otherwise doomed. His resection of the esophagus was followed by his extirpation of the larynx; these led to resections of the stomach and intestines and finally to extended innovations in the field of intestinal surgery, the limits of which have not yet been reached. To Billroth belongs the honor of having performed the first successful extirpation of the larynx, as well as the first successful resection of the stomach.

As a teacher Billroth stands preeminent, for while train-

[2] Gussenbauer, loc. cit.

ing his numerous pupils in the ways of thinking, which his experience had taught him to be the best, he constantly incited them to undertakings of their own, and was ever ready to place at their disposal all the wealth of his own far-reaching knowledge. The force of his own brilliant example, and a certain subtle ability which he possessed of discerning the individual traits of each one, rendered his influence over his pupils all-powerful. Any one who had within him a genuine striving after progress was welcomed by Billroth.

In addition he seemed to have the rare power of forming a just estimate of differences of character. So unprejudiced and loving was his heart, so comprehensive his intellect, that he was capable of attracting to himself even those of unlike aims and wishes. Billroth's enthusiasm and energy of mind live again and flourish in his pupils.

And finally, what was he not as a man! Although coming from a family in which sickness had found an abode, nature nevertheless had amply endowed him with comeliness and strength of body and at the same time had equipped him so richly with sterling qualities of mind and heart, such as are not likely to be soon found united again in one individual. By means of strict, even unrelenting, education of self, he developed into that ideal model as he appeared to his pupils even to the end of his days.

He was a homogeneous whole, not one-sided, as is wont to be the case with so many professional men. His excellent musical capabilities were used to advantage and developed to such an extent that indeed, up to the very end, he obtained solace from this source whenever the grave and onerous duties of the surgeon threatened to oppress him. In comprehension and critical estimation of the masterpieces of the art, he could hold his own with the most famous artists and professional critics.

Wherever Billroth happened to be, he kept himself in close touch with men of prominence in their various callings; in this way he preserved himself from a narrow view of life and its phenomena, and ever maintained an active interest in everything that concerns the beautiful, true and good.

Nor was Billroth averse to the ordinary pleasures of life, considering them a necessary means of diversion for the mind. The decorations of his home, that magnificent Villa Billroth on one of the most beautiful spots on the Wolfgang Lake, were prompted by his own taste for the beautiful, and a desire to make his own, as well as the lives of those around him, as agreeable as possible.

Billroth may be certainly said to have been singularly rich in true happiness and honors of all kinds. Happily married in 1858 to Christel Michaelis, his domestic life was not without its trials and tribulations. His son died in Zürich, his daughter in Vienna. To his three remaining daughters he transferred all his fatherly love and care.

Among his personal friends and intimates were numbered members of many prominent families both in and outside of Vienna. To his numerous pupils whom he constantly assisted with his fatherly advice, and to whom, when in need, he ofttimes lent a helping hand, he proffered the hospitality of his house. And here, within the circle of his family, Billroth disclosed the real man, possessed of all the truly magnificent qualities of mind and heart.

These very qualities, combined with a refined artistic instinct, chained him to Vienna, the city of the musical muse. Here he very soon felt at home; he became an Austrian and a warm patriot. His Austrian patriotism compelled him, a man from the North, twice to decline honorable calls to prominent universities of United Germany. In the year 1872 the University of Strassburg, which, during its reorganization, was richly endowed, offered him a professorship. After the departure of Jünkens from Berlin, he received a call to the Charité Hospital, but again declined. And even when Langenbeck himself, on his retirement from the most important surgical chair of the German Empire, declared Billroth to be his most worthy successor, the latter could not decide to return to his fatherland. He had found his home in Austria; he remained at the Vienna University. His only immediate reward was the grateful cheering of the Vienna students.

Proofs of his patriotism still remained in his creations of a benevolent character in Vienna. The Rudolfiner Association, with its grand hospital in Oberdöbling, and the building of the Royal and Imperial Society of Physicians in Vienna, are his works. Only a Billroth could have accomplished this work.

He was the recipient of a large number of decorations and distinctions from his own and foreign governments, as well as from many learned societies. Among the former he possessed the Russian Iron Cross—conferred for display of extraordinary bravery while in action with the enemy. As regards American Societies, he was a member of the Academia Chirurgia, of Philadelphia; the Pathological Society, of Saint Louis; and of the Societas Chirurgica Americana, of Washington.

Such was Billroth! This man won the hearts of all who knew him. He was honored and revered in numerous foreign countries, wherever the fame of his deeds had penetrated. Nor is he forgotten after death. The imperial capital assigned a grave of honor to him, and countless was the human throng which followed his hearse in deep sorrow for the man and for the scientist. His works and his fame among men still live and will live after him.

The circumstances under which Billroth's book "Wer ist Musikalisch" came to be written are stated in the following introduction written by his musical friend Ed. Hanslick:

Billroth at an early age gave evidence of love and talent for music, which, as he himself always insisted, was hereditary. His grandmother, Frau Wilckens, née Willich, filled an engagement at the Berlin Opera House as soprano, alongside of the then famous tenor Eunicke—the first "Florestan" of Berlin—was also the grandfather of Billroth's wife. "In this way," so wrote Billroth to Hanslick, "I am truly a child of Music and the stage." When a boy he expressed the earnest wish to devote himself entirely to music, but his in-

tention was thwarted by the determined opposition of his mother, for which, however, later on he was deeply grateful. Not that this vigorously minded and cultured woman desired to suppress a love for music in her children; quite the contrary. There is still a letter written by her from Bergen, in which she reminds Theodor to give regular piano instruction to his younger brother punctually; both brothers were then studying in Berlin. Music remained Billroth's tried and beloved companion until the end of his days. During the years of his professorship in Zürich a string quartet met at regular intervals at his house, and on these occasions he himself played either the viola or second violin. He also wrote musical criticisms for the "Züriche Zeitung," and exerted an inspiring influence on the musical life, then at a somewhat low ebb, in that city. Being not only a good performer on the violin and piano, but also a refined connoisseur and earnest thinker in musical matters, he felt during the last years of his life an ardent desire to arrange, clearly outline, and write down his views concerning music. In this matter Hanslick gladly urged him on, inasmuch as he, through his two-fold position of expert musician and trained physiologist, appeared to be unequally fitted to throw light on that line of demarcation at which musical effects and the experience of our nervous system meet.

Billroth's work progressed bit by bit, and was often interrupted. He only succeeded in doing consecutive work on it, at long intervals, during his vacations in St. Gilgen or Abbazia. During the summer of 1888, he seems for the first time to have busied himself more constantly and coherently with his musical views. At that time he wrote from St. Gilgen:

Who is musical? This would be a heading for you for an essay. How complicated this idea is! One man is possessed of especial susceptibility for rhythm (the most elementary rhythmical principle of the human body is the heart-beat); another is endowed with a decided talent for melody (melody cannot be separated from rhythm; the articulation of the human body and its twofold arrangement, with respect to a horizontal and a vertical axis, are a part of its fundamental formation); a third man appears to be musical owing to an outspoken technical and mechanical ability (elementary principle; the pleasure experienced in overcoming difficulties as the chief result of an intensified feeling of self-consciousness); in a fourth, music seems to be the expression of an intense exhibition of emotion as displayed in dramatic expression (elementary principle: a desire to appear to be of as much importance as possible, as seen, for example, in the pheasant when he strikes a wheel before the female); in another, musical talent seems to be the result of a well-developed faculty for the retention of tone-combinations and rhythms; again, in another, music means a predilection for purely sensuous effects on the auditory sense, etc. To me it is all chaos. It pleases me to deceive myself (that is no idle dream of mine), that sometime I may be able to write something sensible concerning matters outside of my profession; and that it is only the short extent of my vacations that prevents me from developing within me some mature thoughts. I like to think this, I say, although I am well aware that it is a delusion. Similarly, in my chosen profession, I have only given the incentive, have acted only as pioneer and blaster; as soon, however, as the ground was cleared, the road made, the blasting done, I gladly let others do the sowing and harvest the results.

In a letter of September, 1890, Billroth again refers to his undertaking:

Your kind encouragement has finally begun to bring about a realization of ideas which have occupied my mind for years. I am now writing an essay: Anatomical-physiological aphorisms about music. Who is musical? It is to form one of a number of essays (which I think of publishing together under the title "Reflections of an Abirsee-promenader") providing that they turn out to my satisfaction. At present matters are beginning to swell like Faust's poodle behind the stove, and I am afraid that the book will represent only the lucubrations of a vagrant pedant. It supplies me, however, with a fund of pleasure; whether it will do this for others is, of course, a question of another kind.

One year later, in September, 1891, Billroth wrote from St. Gilgen:

About a year ago, here in Abbazia, I wrote a fairly large manuscript—"Aphorisms on the anatomy and psycho-physiology of musical matters." It remained untouched for a whole year; I have now taken it up again. The first chapter, "Concerning rhythm as one of the most important elementary principles of music, and one most intimately connected with the human organism," was fairly satisfactory to my critical judgment, so that I made a fair copy of it. The beginning of the second chapter also, "Concerning the relation of pitch to the human organism," seemed good. But after that consideration other kinds arose—speech, song, vowels, harmonics. I began to question the accuracy of some of my statements. This led me to read Helmholtz, which I did at first only cursorily, but after taking up Landois' book on "Voices of Animals," I came back again to the former. I used the fourth edition, which contains much new matter as compared with the first which I had studied years ago. A consideration of vowels, harmonics, speech, etc., brought me into the sphere of psychology—concerning the evolution of speech and song in the child—and in this way to Preyer's highly important, somewhat voluminous, but nevertheless interesting treatise. I really do not intend to write anything of a learned nature, but wish to clear away false notions about such matters from the minds of amateurs. Is the process of composing intimately related with the phenomena of hallucinations or illusions? This forced me to resort to a book on hallucinations, sleep, dreams, etc.; indeed, it led me to a study of mental diseases. I do not care to write a line which might convey the least uncertainty about such matters, nor to use a single word in an erroneous or equivocal manner. . . . Now I have certainly read so much of real excellence, that, for the present at least, I am too timid to look at my manuscript. You can see that I am not destined to become a popular writer. I readily pass over inaccuracies on the part of others so long as the authors interest me; but every statement of my own I weigh with intense seriousness. Thus my contemplated essay can hardly expect to ever become a realization. No matter! If such a work is ever needed, it will be written by some one else. What is occupying the mind of one person at any given time is receiving the attention of hundreds of others.

At last, November 21, 1891, Billroth sent Hanslick a part of his essay together with the following letter:

Although you have often encouraged me to commit to writing various of my views on music, expressed in conversation at one time or another, it is with some feeling of anxiety that I send the enclosed manuscript. If you will read it at your convenience,

you will please me very much. I have written down these ideas partly because I wished to be better able to form an opinion of their real meaning, and partly from the mere pleasure of producing something. But I do not intend, at least for a long time to come, to hand them over to publication. While writing I have kept before my mind the needs of a fairly educated public, but have earnestly endeavored to avoid medical or philosophical cant. In the first two chapters sent you, I think that everything has been gone over which might be designated as "Musical Physiology," or "The Physiology of Things Musical." The remainder is based on conventions. But inasmuch as convention depends on the psychology of the human being with respect to his position as to social or gregarious animal (ζωον πολιτικον), and on psycho-physiology—because of the inseparability of the soul and body—the following portions of this work may be considered appropriate so far as regards the main title.

It is interesting to observe in a man of Billroth's reputation that shy modesty, in connection with his work, displayed—in various letters to Hanslick—such a diffidence as regards his knowledge and style. It must have been a fear lest he should write too learnedly or as a pedant that induced him at first to prefix to a number of chapters musically humorous headings, viz.: I. Marcia (like a march); II. Allegro serioso, ma non troppo (at a not too serious gait); III. Grave (with gravity); IV. Thema con variazioni (theme and variations); V. Serenata (serenade); VI. Intermezzo (interlude); VII. Finale tempo giusto (conclusion at a good gait). These headings, present in his first sketch, he afterwards changed. The title "Who is musical?" was originally prefixed only to the last chapter. It was finally, but perhaps less appropriately on account of its limited meaning, selected as a title for the entire work.

Shortly after Billroth's death at Abbazia, on February 6, 1894, his son-in-law, Dr. Otto Gottlieb, brought to Hanslick the somewhat voluminous manuscript on the cover of which was written in bold script the following: "This manuscript is to be handed to my dear friend Ed. Hanslick, to be disposed of as he deems fit.

Abbazia, February 3, 1894.
Th. Billroth."

The first three chapters appeared in "Die Deutsche Rundschau"; the complete work was not published until the fall of 1895. In a prefatory note Hanslick says: "In his manuscript Billroth designated the first two chapters as finished. The later ones demanded a more careful revision on the part of the editor because of the many illegible corrections, supplementary remarks, and inserted additions. I have tried scrupulously to avoid interfering with Billroth's mode of thought, and style, and have therefore confined myself to making only insignificant changes in some expressions and in removing many needless repetitions.

"The last chapters, although not so polished as the first ones characterized by Billroth as 'finished,' are not less important and rich in content; in fact, they possess for my emotional sense a somewhat unique, and indeed a greater charm, owing to their informal freshness, which is suggestive of a personal discourse."

Themes from "Wer ist Musikalisch?" or Psycho-physiological Aphorisms on Music.

Billroth's work is an attempt to fill a gap that exists in the literature of acoustics, and of esthetics. Helmholtz, in his "Sensations of Tone," attempted to connect the boundaries of two sciences—physical and physiological acoustics on the one side and esthetics on the other—which, although drawn toward each other by many natural affinities, had before his time remained practically distinct. Works on physical and physiological acoustics are by no means rare, and of those dealing with esthetics, pure and simple, there is an abundance. Ed. Hanslick, has ably covered the ground of musical esthetics in his book "On the Beautiful Music" (Ueber das musikalisch Schöne). Billroth makes a modest and largely successful effort to construct a road through the almost unknown territory of the purely psychological in music. The book, as edited by Ed. Hanslick, is called "Wer ist musikalisch?" the title being that given by Billroth to the last chapter in the book, and designated by him as a sketch. The selection does not seem to me a very happy one, inasmuch as the title by no means represents the matters treated of in the volume.

The book contains some 250 pages, and is divided into seven chapters. The first treats of rhythm, an essential element in music, which is intimately associated with our organism. Nearly all human beings and many animals are agreeably moved by repetition of rhythm. Human beings feel induced to execute similar rhythmic movements with their body, particularly with the head and hands. This may be explained on the ground that the movement felt as a rhythm acts upon certain properties of our body, which are known to us from experience and to which we are accustomed by practice and exercise, so that the perception of a rhythm may be transformed without reflection into a rhythmical movement.

Rhythmic movements are among the most important properties of our body, and are necessary to life. Thus for instance, we have rhythmic movements of respiration, rhythmic movements of the heart, and the rhythm which we are capable of imparting to our voluntary muscular movements. It is probable that all muscular movements of the body, conscious or unconscious, are brought about by a summation of numerous infinitesimal and imperceptible rhythms.

The psychic contagiousness or power to cause imitation which rhythm exercises upon human beings is well known. The psycho-physiological law of sympathetic movements and sympathetic sensations (*Mitbewegung und Mitempfindung*) has such a wide distribution in the animal world, and is of such eminent significance for our entire social and ethical culture that it gives the impression of a fundamental natural law applying to all organized matter. The effect exercised by human beings upon one another is based upon it. When Billroth speaks of sympathetic movements and sympathetic sensations as the results of a transference of psychic and physical rhythm, he has mainly in view the transference of a

movement or sensation, through observation by the senses, from one individual to another. Speaking purely physiologically, sympathetic movement is often used to describe the transference of excitation from one motor nerve to another, and sympathetic sensation would mean the transference from one sensory nerve to another. This latter conception has little bearing upon Billroth's consideration of rhythm.

It would lead me too far to enter upon a consideration of the powerful social consequences of sympathetic movement and sympathetic sensation, in which we must, according to Billroth, recognize one of the strongest foundations of ethics. He next considers the tendency to appreciate rhythmic movements as it is continuously impressed upon us by observation of our fellow creatures, men and animals. In an entertaining manner the rhythms of the movements of a horse are described. The walk is compared to the Andante (2/4), the trot to the Allegro (2/4), the gallop to the Allegro con brio (3/8), with a 1/16 up-beat (*Auftakt*), the canter (Presto 2/4). The description of the rhythms in the walk of hens is almost comical, while the recognition of those hidden in the call of the cuckoo, of the quail, and of the cock, shows an analytic and careful observer.

Billroth asserts that a fundamental condition of music, viz.: the more or less conscious ability to receive and appreciate rhythmic movements, must be innate in man and many animals. This question is intimately associated with the problem whether the aspects of time and space are also innate with us, *a priori*, in the sense of Kant. Billroth's opinion is that these capacities are born in us, but they can only become conceptions by experience. The perception of rhythmic movements occurs with varying intensity in different individuals, and it may or may not lead to sympathetic movements. The event will depend upon the power of observation and experience on the one hand, and, on the other upon the greater or lesser irritability of the nervous organs, and also upon the degree to which excitation can be transferred from the tracts of special sense to the motor paths. The quicker or slower propagation of nerve excitation, is a quality that may be innate, or may be developed by custom. Every one has noticed the difference between vivacious and phlegmatic temperaments. Most European nations, particularly the Romance South Germanic, and South Slavic tribes, are in general of a quick, vivacious disposition, and love this temperament in other men; whereas the inhabitants of the North, as well as the Oriental nations, have a quiet temperament, and give preference to this also in other people. Of course there are individual exceptions. Religion and custom in certain great tribes have in a few instances idolized the acquisition of the greatest possible indifference in temperament, including not only the suppression of every individual emotion, but the encouragement of the greatest possible independence from surrounding stimulations. Similar principles, according to Billroth, constitute the highest ideal of human perfection in the education of the English nation. The freest and the most perfect individual is the one who can appear independent of all external influences, like a rock in a stormy sea. To be moved or to show emotion under the influence of environment means to become ridiculous; such Billroth conceives to be the force of English custom. Inquisitiveness and the pleasure caused by changes in the external environments, are not totally excluded, only there must be no expression of this sensation. This is an Oriental trait. Whilst the powerful significance of such innate and acquired peculiarities of character are not to be underestimated for practical life, nevertheless, so far as the appreciation of music is concerned, such men are wanting in the most fundamental requisite. Individuals who have no perception of joy or pleasure resulting from sympathetic sensations or sympathetic movements, and in whom the expression of any possible joy has been gradually deadened by education, must of necessity become unmusical.

It is a commonly accepted view among the laity that the feeling for rhythm is innate in every man. Billroth disproves this idea by a number of statistics from Austrian and Hungarian regiments indicating that in some regiments there are recruits, amounting to 2 per cent of the total number, who never learn to march rhythmically. These men are not permitted to appear in the parades, or are transferred to cavalry regiments. Besides these there are always about 20 to 30 per cent of recruits coming from Roumania and Bosnia, the mountainous countries, who remain awkward; sometimes they imagine they march well, and are surprised when they are criticised. In a Polish regiment there were to be found soldiers who had served 10 or 12 years, and who nevertheless could not march rhythmically. Some of them would march passably well when they were in the ranks, where they could watch the feet of other soldiers and be guided by their eye, but they could not march by themselves. It is therefore correct to assume, that the rhythmical feeling is not innate in all human beings, and that there are some who cannot even be taught to appreciate rhythm. They must be absolutely unmusical, for the ability to apprehend the rhythmic organization of tones into a melody is the fundamental and first condition for the comprehension of music. The popularity as well as the longevity of certain music, depends far more upon the rhythmic, than upon the melodic property. All the songs of the people are constructed in a very simple rhythm. The rhythm of a melody, in order to be popular, must not only be short and simple, but must frequently be repeated in the same manner.

From popular songs the author turns to a consideration of popular dances; and in an interesting paragraph gives suggestive historical facts, tracing back the dances among the mountain inhabitants of Austria to those of ancient Greece. This section is of unusual interest, but can only be touched in a cursory manner. The dance is one of the oldest arts spoken of in history. Simonides calls it mute poetry. It would be interesting to know how David danced before the Ark of the Covenant; what was the step of Louis XIV in the minuet; what was the dance that Aspasia taught Socrates, and that of the guests at the banquet of Xenophon.

But to go back again, rhythm is asserted to be more im-

portant for the longevity of a composition than melody, because it is the more elementary of the two, and is more intimately associated with certain fundamental properties of our body. Melody is always more or less dependent upon conventionality, upon habit, and fashion. As illustrations we may take the compositions of Händel, Marcello, Bach, and Scarlatti. The melodies of these masters appear strange to us, and their harmonies monotonous and occasionally ugly and bizarre. What has perpetuated these compositions, according to Billroth, are the incisive energy and the abundance of wonderful rhythms. Many great masters in music have lived after them, but they could not create anything more powerful and impressive than the rhythms of these composers. It seems that the creation of magnificent rhythms in music has been exhausted—a condition analogous to that as existing in drawing and painting, and in the disposition of space in architecture. Both seem to be exhausted since the productions of the masters of the renaissance period. Billroth does not consider that R. Wagner's compositions have become extensively appreciated, and what popularity this master has obtained is due to the exquisite rhythm in the beautifully-formed Wagnerian Motives. The endurance of Meyerbeer's four great operas is attributed principally to the great care that had been bestowed upon the rhythmic development of his music. When the sensation for rhythm has entered consciousness as a pleasant perception, and when it has caused sympathetic sensations and motions, it becomes incorporated in memory, and we begin to combine and play with these inner musical conceptions. It is an interesting, fascinating, and esthetic playing of our fantasy. By playing Billroth does not mean toying or trifling, but rather the association and combination of musical memories and conceptions. We could not say, if we are conscious of such melodic and rhythmic cerebration, that we are playing, but we would have to say as the Germans

"Es spielt in uns" (It plays in us).

This playing may be a partly unconscious and a partly conscious and active process with us. Thus a philologist or a poet plays with language conceptions; a mathematician plays with numbers or geometric forms; a painter plays with visual forms and colors, and so forth. Why one individual plays more particularly with one form of conceptions, and another with others, and why in one person one group of conceptions will remain in memory, and another group be forgotten, depends in the first place upon his organization, and the inherited peculiarities of his character. In every man will be fixed those perceptions of the senses, for which he has inherited the greatest receptiveness and ability for comprehension. This play of the conceptions leads to various results and actions which will vary according to the talent and character of the individual, and according to the characteristics of the human beings into whose society he is born at a certain time.

The acuteness and distinctness of musical perception depends upon three properties of the mind, which may be partly inherited and partly acquired. These are the following:

I. *Memory for Rhythmic Forms.*—An individual who does not possess this ability, or who cannot acquire it; who cannot recognize the repeating individual rhythmic structures in a continuous composition; who, for instance, has forgotten the beginning of a musical sentence at the end of the same, is not capable of the perception of genuine pleasure at the hearing of complicated rhythmic combinations.

II. *Pleasure at the Change of Conceptions.*—This capacity, which is peculiar to man, and in animals possibly occurs only in the highly intelligent that are in constant association with man, is inactive in indolent human beings.

III. *Pleasure at the Increase of Conceptions, and the Augmentation of Memory. Pleasure at Overcoming Difficulties.*—There can be no doubt about the elementary significance of rhythms, and the arrangement of modern music into measures, when one reflects that the attractive and charming cooperation of several instruments or several voices is inconceivable without rhythm and measured arrangement. The effect of various rhythms in causing certain sensations and conceptions, is of interest. A rhythm that we hear, or a rhythmic motion which we see, may cause a direct sympathetic movement in us. For example, we begin to beat the time with the hand when we hear music, or we feel induced to imitate a rhythmic movement which we see others execute; but the same sources of excitation may cause other conceptions by association; such for instance, as may have been deposited in our memory on former occasions by or simultaneously with that particular rhythm. For instance, dance or funeral music may remind us of a joyful dance or of a sad funeral. There may even be recalled to memory conceptions of certain persons, whom we met at the dance or at the funeral. All at once a definite landscape, a hall, a room, or the inside of a church with all its detail, may appear before our mind's eye, and we may be moved by the identical sensation that filled us when we heard similar music and the same rhythm for the first time.

Rhythm may effect an accelerating and inhibiting influence upon the psychic movement, the frame of mind in which we are momentarily. This leads the author to the question whether rhythmic movements alone—simply as such—are capable of expressing or communicating anything. This of course is associated with the question whether music without words can express ideas. That this is possible to a high degree, is evident, and an analogy is found in the so-called language by gestures. Rhythms may be perceived simultaneously by three senses. They may be heard, seen, and felt in our muscles. Now, as the influence on consciousness may be exerted from three senses at the same time, it is evident that the major part of our nervous system is occupied in the process—a fact which readily explains the marked effect exerted upon the entire organism. The relation of rhythm to several senses simultaneously has been described by Aristides.[3]

Billroth next compares rhythm in motion with rhythm at rest—*symmetry*. Moving rhythm is the arrangement or disposition of time, while symmetry is an arrangement and or-

[3] Westphal, Griechische Rhythmik, page 47.

ganization of space. This close connection with thoughts on the rhythm and harmony, as expressed in painting, sculpture, and architecture, explains the author's inquiry as to whether the perceptions of rhythm and those of time and space are innate (in the sense of Kant).

In the third chapter, an abstract of which follows, Billroth deals with the development of the musical with the science of music.

The term Physiology (Natural Philosophy, Physiology of Man, the science of dealing with the functions of the human organism), in recent times, has often been employed in popu-

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lar works in connection with matters that refer far more to culture than to nature;[4] whence has arisen much confusion concerning the character of the "original" or "natural," and its relation to the acquired or artificial. On this account I consider it necessary to explain here that we, with what has been previously said (in the first and second chapters), are at the end of our purely physiological considerations, in so far as they are related to music, indeed, that we have already crossed its boundaries here and there and touched upon the domain that has been acquired by purely psychological work.

The soul (Psyche), according to the views of the present time, is not to be separated from the body, and the phenomena in its domain, therefore, form a very essential part of physiology. Nevertheless these phenomena ap-

[4] Physiology of the Social Body (Schäffle), of Law (Stricker), of Love, of Hate, of Marriage, etc. (Balzac, Stendhal, Mantegazza, Bourget).

pear to most people as distinct, separated from the body. This I find very natural! The entire development of the civilization of mankind, its power, though limited, over many forces of nature, the comparative comfort of the ruling classes in the social divisions created by themselves, have not developed from the purely physiological, physical struggle for existence, but are victories which, especially in historic times, have been won principally with psychic weapons that are continually being forged in the smithy of the human brain. We cannot, therefore, be astonished that the psychic appears to the man who has not received an

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education in natural science, as something distinct, higher, separated from and controlling the brute force of the body.

And yet the soul is more dependent upon the body than the body upon the soul. What we call perception, thought, conception, consciousness, could come into existence in the absence of a brain. To be sure, there exist, not only in the lower animals but also in man, unconscious bodily sensations and bodily motions (reflex motions) which take place without the so-called psychic phenomena, as in a well-constructed machine.

It seems not only inadvisable, but, in the present condition of society even absolutely harmful that in popular works so much stress is laid upon the dependence of the soul, because the constraint of the will is naturally connected with it. To such a degree does the entire structure of human society rest on the social dogma of the freedom of the will and on the consequent responsibility of the individual for his actions, that the beautiful edifice would be shaken to its foundations if

everybody were to maintain that all his thoughts and actions were nothing but the result of phenomena in his body, conditioned by his individual bodily constitution, his inborn psycho-physical character, for which he could be made responsible as little as for his existence. Indeed, as one of its great aims modern investigation has set itself the task of explaining the development of all ethics, as well as the rise of religions, as purely psycho-physic necessities, and as the natural consequences of the structure and composition of the human organism. But even if we were beyond the very first beginnings on this path, I should consider it dangerous, as yet, to practical ethics, to raise the veil from these mysteries of our temple of sciences before the populace.

Without going further into these and similar considerations, let it suffice to say here that the term "psycho-physical" or "psycho-physiological," as used at present, is applied not only to the connection of the qualities of body and soul but also to the treatment of psychology by means of physiological methods. If, therefore, that which I have still to say about the "Musical" does not belong to the domain of the purely physiological, it nevertheless is included under that of the psycho-physiological. I will go still further and put the results, due to social forces, of certain concessions and compromises in the domain of the musical—the "conventional"—also in the domain of the psycho-physiological.

"Conventional" and "natural" are in a certain sense antitheses. But to simply identify conventional with unnatural is in itself wrong. No creature can do anything that is not made possible for him by his natural organization; the unnatural cannot at any time be acted or even thought by man; for man cannot think anything else but what the nature and organization of his brain allow him to think. The conventional is the natural result of human striving toward conditions that bring advantages and give pleasure; it is one of the results of and at the same time one of the conditions underlying the existence and advancement of human society; it is not imposed upon society by tyrants, heroes or gods, but imposes itself, just as law and custom, and like these, it varies in its practical consequences according to place and time. The formal development of the conventional requires, to be sure, one, sometimes more, personages; these are the typical expressions, to a certain degree the embodiment of a determination or will of society (Gesellschaftswillen) or of the people (Volkswillen) in a certain time—a determination which has not yet come to a definite expression. They become leaders, lawgivers, heroes, and to us, if the mental tendencies of a long past form of society are not well enough known to us, they may appear as arbitrary tyrants, although in reality they were the slaves of the spirit and the will of their times. The same holds true for the rise of fashions; the need of society for change arises from a similar need in the individual; attempts are made by this man or that man to take the lead; whoever finally strikes the taste of the majority becomes leader. "Fashionable" and "Conventional" are terms for the same psycho-physiological processes in the organism of human society. *In this sense the conventional also belongs to the nature of man and of human society.*

After these explanations of terms to be used later on, let us return to the "Musical."

It is justifiable to assume that the feeling for rhythm and the power of perceiving differences in tone pitch, tone sound and tone strength, as well as the capacity of differentiating these qualities in rapid change and combination are the physiological prerequisites for what we now call musical. Nevertheless, that everybody who has these qualities, is *ipso facto*, according to the customary use of language, to be called "musical" must be unconditionally denied. Does every man, unless he has been born absolutely deaf, possess the aforesaid psycho-physic qualities? This question cannot at once be answered in the affirmative. We cannot observe the inner phenomena of another man directly, but only deduce them indirectly from his physical utterances, especially from his reflex motions or his motions of accompaniment or imitation.

If we take as a standard for the rhythmic sensibility of a man his ability to correctly accompany seen or heard rhythmic movements, or to imitate them, we should occasionally, although seldom amongst civilized peoples, find persons apparently incapable (refractory) in this respect. As was pointed out above there are men whom it is impossible, or at least very difficult, to get to march or to dance in rhythm. This may be based on awkwardness. One of the most remarkable examples was Beethoven: eminently successful as he was as pianist, he is said never to have succeeded in dancing in time. It is also said of the singer Malibran that it was impossible to dance with her, because she did not keep time; and yet she was very fond of dancing. In both cases the defect could hardly have been entirely due to the lack of the feeling of rhythm; it could certainly have been obviated with some practice, unless it arose from a kind of shyness to exhibit one's self before others. This, indeed, is very difficult to remove.

Much more frequently we meet with people who find it impossible to repeat accurately a tone that has just been sung, and who claim that they do not perceive intervals of quarter tones or even half tones, even when sounded together. A false note in an opera, since but few concentrate their attention entirely or largely on the music, is probably noticed by hardly a fourth of the audience; the tremolo of the singers by a much smaller part of the hearers still. A not quite accurate reproduction of a tone, so frequent, especially among beginners in vocal music, is not always a proof that the person singing incorrectly is unmusical; often it is only the result of inattentive listening and of an awkwardness in the motions of the laryngeal muscles, and can be removed as soon as the ability to perceive the impurity of the tone exists at all or can be awakened from its slumber. Singing incorrectly on the part of trained musical singers, especially on the stage, is principally due to psychic causes—excitement, fright, and also overexertion. Most people probably distinguish whether a tone is strong or weak and whether it is produced by an

oboe, a violin or a human voice. But there are individuals who seem to have no conscious sensation even for greater tone intervals, indeed even when one tone is relatively much higher or lower; they think they are imitating a song correctly when they reproduce its rhythm alone, and with it arbitrarily use first one tone, then another, or always the same. These persons, to be sure, are hopeless cases so far as regards a musical education; and yet they may be passionately fond of music with a kind of childish delight in rhythm and combinations of tones as such, just as other people take delight in brilliant colors without being in the least endowed with the artistic sense.

It is only since the appearance of the epoch-making book of Helmholtz that musical physiologists, psychologists and specialists in ear diseases (Preyer, Stumpf, Politzer, Urbantschitsch, and others) in the last decade have busied themselves in determining with greater accuracy the physiological and psychological foundations of tone sensations and tone combinations and their closer relation to the music of our era. As a result of their studies very remarkable facts have been brought to light, showing on the one hand how widely the power of distinguishing tone intervals varies in different persons, and on the other hand how much may be obtained by systematic practice, even in the case of deaf-mutes (Urbantschitsch). It would lead us too far into details to treat this more fully. Suffice it to say, that the cause is to be found more rarely in corporeal defects (consequently defective or partially destroyed organs), in the auditory apparatus than in defective afferent nerve impulses and faulty attention to complicated sound impressions. Indeed, there exists a total psychic indifference toward all sound perception, especially toward all combinations of sounds, which might be termed a harmonic nihilism, a harmonic deafness. A friend of mine, who enjoys songs, and occasionally goes with his wife to a concert, is without any perception of the agreeable or disagreeable in the combination of tones. He forms the same impression on hearing a chord of three sounds that he does when he hears five neighboring tones struck at the same time. Thus, when I played for him the air "Wir winden dir den Jungfernkranz" in F sharp major on the piano, and accompanied it in F major with the left hand; he said, "That is from "Der Freischütz." I repeated the F accompaniment with the left hand and played the air in G major. I asked "Do you notice any difference?" He reflected a while and said: "I believe it pleased me better the first time."

To appreciate the fact that in a large concert hall there are a hundred or more auditors who stand on this same plane, and that there are many more to whom all variations up to a third sound as one and the same tone, so that for them there are at the most only four well-defined tones in an octave, and that for these there does not exist any incorrect playing or singing at all, must certainly cause a somewhat gruesome feeling in the mind of the artists—"Love's Labor Lost." But during the thundering applause, the musically deaf probably clap more violently than the really musical. In my friend there was really a musical force present, that is to say, the memory for the rhythmic: he recognized the air as taken from the "Freischütz." But even this memory may be wanting and yet the individual may play the piano. A young girl who had taken lessons on the piano for two years, was practicing a piece of Mozart's, and was ready to play it for her teacher. She came somewhat late and found him sitting at the piano and playing. In order to make her presence known she asked: "What are you playing there?" The teacher turned around astounded and said: "Why, that is the piece you are to play for me to-day." "Indeed!" She then played the piece faultlessly and the instruction was continued. This lady married a very musical man. Of their three sons, all very intelligent, two are absolutely unmusical, the middle one is exceedingly musical. To give another example of an apparently unmusical person: A very musical couple had a son who seemed, when a small child, not to take any interest in music. When he was about eight years old, his mother would sing airs for him, which he, however, could not repeat; nor could he sing a note struck for him on the piano. His mother consequently considered him totally unmusical. When he was about twelve years old, he came now and then when his mother played the piano and said: "That is pretty, mama." As time went on he could sing and play correctly melodies which he had heard, and later became anxious to learn to play the violin. In this case there was a small degree of attention to sound-impressions during earliest childhood, together with awkwardness in reproducing with the laryngeal muscles the sound heard, which in turn gave rise to a sort of shyness, from fear of making himself ridiculous by unsuccessful attempts.

These three examples from my latest experience (I formerly gave the matter no particular attention) show how manifold the coefficients are which determine whether a man is musical or not musical.

I should prefer to call them, along with the aforesaid rhythm defects, tone interval defects. It is to be hoped that both are the same, for otherwise the number of the non-musical would be frightfully large, especially if the only slightly musical be also added to it, those, I mean, who are born with an appreciation of rhythm and a perception of the smallest intervals but who have no memory for music (for two successive bars) and for whom music as such has so little interest that they find absolutely no enjoyment in directing their attention to the succession of tones. Nevertheless, these persons occasionally remember airs and sing them tolerably well.

"Who then is musical?" The answer to this, apparently so simple a question, is very difficult and extremely involved, because the term music is used just as well for the beating of a tambourine as for the most complicated polyphonic vocal music. Any one who tries to answer the question must of course consider himself musical, otherwise he certainly would not make the attempt. But here there can exist self-deception, for not infrequently we hear people talking of things concerning which they know nothing and yet think they know much. I must leave it to the reader whether he holds me to

be musical and to what degree he will admit my right to give a verdict.

The concept "Music" has, as said before, become very complicated. There are various degrees (I might almost say kinds) of being musical, because the science of tones is composed of different elements, of the rhythmic, the melodious, and the harmonious, and in each of these elements there is again a purely technical and a purely esthetic element. A person may have more talent, interest and responsiveness for one than for another of these elements, just as those with talents for the pictorial arts may have more interest and talent for drawing, or for artistic composition, (lines) for coloring, or for the purely technical. The longer one ponders over the matter, the more complicated becomes that which we now call "Music," and I can only venture the bold attempt, to answer this question, after I have tried to make it clear *how that which we now call music or the science of tones arose, and how this science affects us.* Herein I am only following a scientific tendency of our age, in which we try to understand all that is about us and in us, from its origin, and which only bows down before the "inherited" or "inborn," or in other words the "marvelous" when we can get no further on in our attempts to comprehend with our sensations, observations and thoughts, the phenomena in Nature and round about us in human society. This limit is, to be sure, reached soon enough. Nevertheless, these attempts are the sole sources of that which can create new knowledge for us, and we ought not to be discouraged at the slight result of our work, which when compared with the whole, it must be confessed, is very small. "There seems to me to be no warrant that our understanding must necessarily conquer *everything* which can exist on earth."[2]

Every creature devotes its attention primarily to those sense perceptions and performs those movements which afford it an advantage in the struggle for existence, or cause a pleasant sensation (a feeling of pleasure).

The first cry of a new-born child is a purely physiological, a so-called reflex action, which reaches consciousness just as little as the first perception of the senses and of motion. It is only with the gradually developing consciousness, with the rise of the personal feeling (ego) that perception begins; the differentiation of sensations is made consciously; the attention is directed to single ones of these sensations; these are lifted up into the inner aspect, and finally there results apperception. The child, through its muscular sensations (that is through the sensations of tension, of contraction and of laxity of its muscles), gradually reaches a consciousness that certain processes within itself are connected with certain muscular motions; it then tries to call these muscular motions forth by means of images from its memory. When this is done successfully the first conception of causality has developed in the little cosmopolitan, the steps being in the following order: Sensation, perception, differentiation, conception, will and motion—all arising out of experience. The child begins to carry out conscious movements; for instance, to cry intentionally. This has for it a quickly apparent result: as a consequence of its crying it is nursed, and now experiences the highest pleasurable sensation which it has as yet learned to know. At the same time its conception of causality has greatly expanded; the association of its concepts and its movements has led it to this conclusion: "If I cry, I am suckled." Its logic is about to develop.

Meanwhile the child hears not only the sounds which it produces itself, but soon also distinguishes different kinds produced by others. It soon learns to know the different pitches in which people speak, and soon recognizes the different tone-colors of voices. If its attention has once been directed toward the differences of these sensations, it tries to produce these variations for itself, which can only be done by means of different muscular movements, which are experienced by it. It sees and imitates many such movements (mouth positions), others it discovers by means of its own attempts. It will call forth and reproduce, more especially, those movements which are pleasurable or useful to it.

If we leave the nursery and try to imagine grown-up men in the primeval condition of intercourse, we may well take it for granted that they soon discovered how much sounds, that were produced consciously and intentionally in different pitches and timbre, assisted communication by means of visible gestures of the entire body or parts thereof. The more man became conscious of the extraordinary power of modulation of his voice by means of the play of manifold, empirically discovered movements of the mouth, tongue and gums (naturally without having the least idea of the physiological and physical processes involved) and the greater the practical benefit which he learned to draw from it as a social creature, ("political animal," Aristotle), the more he developed these "sound gestures," that is, spoken language, and in the course of time used it even predominantly for communication, and neglected the further development of speech by means of visible gestures of the other parts of the body. The visible gestures of the entire body, which even now form the principal means of intercommunication of animals, are used by civilized man only as an adjunct to speech, although among some nations (for instance, the Italians), they are still very largely used. They fall into entire disuse with the introduction of the written language as a means of communication, which, owing to the acquired necessity of connecting certain sound images with certain definite symbols, can call forth within us any desired circle of representations (Vorstellungskreis), in the same manner as the objective perception of gesture and sounds. Next to speech itself, writing is probably the greatest invention of the brain of the "political animal," because it is practically the most full of meaning.

Without the ability to perceive and produce different sounds

[2] Helmholtz had two classes of critics of his Sensations of Tone: (1) Psychology objected to reduction of esthetics and emotion to physical cases. (2) Physicists and mathematicians claimed he had not gone far enough in explanation of physical cases.

in different pitches, the development of human speech would have been impossible.

Would not, however, the ability to distinguish and produce only different pitches have sufficed to form a pure tone-language? Would this not have been possible with even one tone alone? This cannot be doubted. Such a language might have been formed somewhat like the telegraph code, which consists only of different combinations of dots and dashes (shorter and longer tones); and if we imagine these dots and dashes to be variously colored (different pitches) then we would have at our disposal a richer supply of expressions. One could use in this way acute and grave tones, rhythmically combined, for the development of a tone-language, without any participation of the mouth, the tongue or the gums, that is, without the simultaneous use of different tone-colors. But such a proposition appears to me just like asking whether man, if possessed of only one leg and two arms, or of two legs and one arm, could have attained the same completeness of social development as with his present shape. The fact simply is, that he has four extremities, of which the rear ones are much stronger and longer than the front ones; therefore, he walks most comfortably upright and develops his arms and hands for all sorts of useful and pleasurable purposes. Thus man has an oral cavity which allows very great changes in form. This capacity is lacking in the majority of the higher animals, since their oral orifices reach nearly back to the rear teeth, and on this account the formation of the various vowels as well as most of the consonants is impossible for them. Man has an exceedingly flexible tongue; he has the ability to cut off the connection between the mouth and the nasal passages by means of the velum, and by means of experiments and experience he has learned not only to produce with this complex apparatus the manifold modulations of the tones of his larynx, but also to render the distinctions clear. It was more convenient for him to use this apparatus for coloring tones, employing few changes of the tones of his voice, than to develop the latter into a pure tone-language. We speak more easily than we sing, because speaking interferes much less with the breathing process than singing, and also because the laryngeal muscles tire more easily than the muscles of the oral cavity, etc. A singing in quick, short rhythmic movements (dots and dashes) such as would be requisite for a pure tone language, if the latter were to have a completeness even approaching our present tone-color language (Klangfarbensprache), would bring us so often in collision with our breathing-rhythm that the effort would become a torture for us.* Man could, if he were compelled, by means of continuous practice, even in this direction perform wonders; indeed he could get so accustomed to the system that he would no longer experience its discomforts. If such a style of speech were to become the fashion, who knows what would happen!

It is still a long way from speech to song and thence to music, and yet, according to my conviction, song (even if not all music), developed out of speech. I imagine the process to have been somewhat as follows:

To the original "sound-gestures" belong especially the words of address, exclamations and interjections. Tones, lasting for a longer or a shorter period, are uttered strongly and repeatedly, as the mimical expression in sound (klang-mimischer Ausdruck) of a condition of sensation. This probably was, in the beginning, a purely reflex process, analogous to the cry of the new-born child, but soon became a consciously used, useful means of expression. In very loud speaking, in the public, loud praying of priests it was found especially effective with the audience, to at one time raise the tone of the voice, at another to lower it; possibly this was not at first intentional and occurred as a natural result of the exertion and fatigue of the laryngeal muscles. Most people end a sentence with a lower tone than that with which they started—a tone-falling or cadence. To emphasize single, especially important, words, the voice was raised to a higher plane; by this means the speaker succeeded better in retaining the attention of the hearers than by talking in a monotone pure and simple. The more strongly breathed word becomes somewhat higher, just as the gas jet becomes brighter on account of the stronger pressure in the service-pipes. Stronger intonation is at the same time unintentional tone-elevation; but the speaker also often goes to a higher level; the orator intentionally uses different tone-elevations; his speech is, by the side of sound-gesture, also tone-language. In ordinary conversation we keep probably within a fifth; in excited discourse we probably use an octave. These aids to expression were probably used more especially by priests, seers, prophets, orators and narrators; they simply proved to be useful for the attainment of the desired effects. From such a pathetic way of speaking to a half-singing reciting is an easy step, and finally a scarcely noticeable transition. Soon the priests prayed almost altogether in a singing tone. This custom came over from the Greeks and the Jews into the Christian Church, and was there developed in several directions. In all these cases the singing tone serves only as a practically useful strengthening of the expression. The tones of speaking still rule over the tones of singing.

Tones and words, when they are both connected in similar rhythmic members, approach more nearly what we at present call vocal music. Herein also one of the most important factors of music is developed—*a division of tones into a definite succession of intervals.* In ordinary speech one can let the tones of the voice run into one another without becoming actually indistinct; the thorough comprehension of a verse rhythm requires more sharply differentiated tone intervals. Finally, the verse brings with it the most important element for the form of music—the repetition of the same or similar, larger or smaller rhythmically formed parts. The single

*The birds have predominantly a tone language. The parrot, on account of his thick, very flexible tongue and the shape of his relatively short oral cavity, is qualified, physiologically, for human tone-color speech, and intelligent animals of this kind can, it is well known, be trained to repeat words of the human language, as well as to imitate human whistling in various pitches.

verse foot resembles a musical bar, the verse line (stichos) the melody-air, or "motive"; a group of verse lines resemble a "melody," or a "Melos" in the Greek sense of the word. The verses, when sung, give rise to regularity and order in the world of tones. *From the linking together of a succession of tone intervals, and of rhythm, in the narrower and the wider sense of the word, the science of tones—that which we now call "Music"—was born. With its release from these bonds it dies as a science.*[1]

[1] Aristoxenus long ago made very apt observations about spoken and song rhythm. He says, according to Westphal: "In declaimed poetry, we, to be sure, experience strongly the difference between the rise and fall (thesis and arsis) of the verse foot; but it is very difficult here, perhaps impossible, to assign a definite space of time to these two periods; we are satisfied if the period allows us to note a certain number of accents (ictus); how long or how briefly one dwells on the enunciation thereof does not concern us; we take the privilege, and see in it just the advantage of a well-expressed style of declaiming, of resting longer on such syllables, which are especially important for the logical sense, irrespective of the fact whether it is done by a longer-continuing enunciation or by pauses; and it is also a matter of indifference at what these pauses occur; whether at the end of the colon (verse foot) or within the colon and the verse foot. (One sees from this that already in the delivery of Greek poems that were not sung, particular attention was not always devoted to the length and shortness of syllables, upon which Greek metrics are founded. Note of Hanslick.)

"In music, however, the duration of the arses and theses are subject to a definite measure of time, and likewise the pauses occurring here are integral parts of the rhythm. By the symbols $-\cup$ we understand that the second syllable is half as long as the first, accordingly $-\cup = \text{♩}\,\text{♪}$ or $\text{♩.}\,\text{♬}$ They have no absolute value. (Except when they are determined by the metronome. Note of editor.) The values of the rhythm, assumed at the beginning of a piece, in music remain the same; in declamation, on the other hand, they may be changed at pleasure. In the rendition of songs, the change in time of the smallest parts of a bar (of the Chronos protos) has become almost the rule; it is just through this that this kind of vocal music approaches speech; but the musical rhythm must never be neglected to such an extent that it becomes incomprehensible to the listener. Herein much depends upon the art of the singer. The free instrumental 'performance of the melody of a song' rests upon the fact that it takes liberties, just like the singer, as if it desired to play words, and thereby often scores a great effect, and makes an impression very much as does a song. Exaggeration in a performance in this direction is in bad taste; it can easily become unmusical. The so-called phrasing must, in spite of all freedom, always be simple, clear and musical, and never leave the listener in doubt as to the kind of time. Liszt, Rubinstein and Joachin were and are masters in this kind of playing. Modern music, like that of Chopin, Schumann and others, permit of a performance that gives very much more the effect of words. In the music of Bach and Händel, as well as in that of Mozart, Brahms and R. Wagner this kind of playing has an absolutely bad effect. These composers treat the composed verses metrically and musically-rhythmically with as great a degree of correctness as modern taste permits, although by this I do not mean to say that they ought to be sung according to the metronome. Every composer ought to be treated according to his style. A sensible actor does not play and speak Shakespeare in the same way as he would Dumas. Similarly, a sensible singer sings Händel differently from Massenet. He who makes the mistake, in rendering the simplest song, of laying pointed emphasis on every word and verse of the poem—effectively for the mass of a concert audience as he imagines, that is, for the unmusical or the slightly musical—often produces a musical caricature. He who performs purely musically, without much reference to the text, can give much enjoyment to the musical connoisseurs, in his singing of an aria of Händel or Mozart, but the vast majority of the audience will be entirely unresponsive, the more so, if he emphasizes or tries to emphasize also in singing songs only that which is the purely musical. To keep the true mean depends on the character of the singer, which may be somewhat changed, that is, restrained or stimulated by frequent hearing of other singers, and also by a good music teacher. But one soon learns to recognize that which has been acquired, and finally the character of the singer will reassert itself. It is given to but few to quickly find the musically correct for the largest portion of the audience, wherein the personality of the singer has a large share of the success. In a dark concert hall the judgment would be very different; the public wants to see, and especially *see itself*."

Since one can find in every history of music the representative of the so-called old musical modes or tone-scales, from the Greeks down to the Middle Ages, and their physical explanations in the classic work of Helmholtz, I shall not go further into this subject and will only add that, in my opinion, these tone-scales were only determined after they had long been in common use. The musician composed (granting indeed that this word can be employed for the old recitative music), not according to fixed tone-scales, but constructed the tone-scales from the existing compositions, which persisted principally through tradition. But doubtless the development of the language, especially the pronunciation of the *vowels*, had a great influence upon these. We all know that with the same laryngeal tone (Kehlkopfton) we can pronounce the various vowels, that is, we can change the tone-color of the laryngeal tone by means of modifications of the oral cavity to such a degree that of the different tones of which the laryngeal tone is composed, now this, now that higher overtone or undertone is heard to resound predominantly in unison. If this were not so, or even if it were possible only to a certain degree, one could only speak and sing the deep-sounding vowels (U, O, Au) with deep laryngeal tones, the high vowels (Ae, E, Ue, I) only with high laryngeal tones. In fact it is difficult to produce the deep vowels on high tones and the high vowels on deep tones, but this can be done with practice.

According as certain pure or impure vowels predominate in a language or dialect, so must certain cadences become easier for the hearers or speakers. If one determines them according to their sound, by means of notes, and brings together the tones occurring at the various intervals according to their succession of pitch (Höhenfolge) within an octave, then one gets those tones, which are used, as a scale of tones following one another—a tone-scale. It is clear that such a tone-scale must result very differently, according to the language of the people concerned (Lydian, Doric, Ionic), indeed even according to the taste of the individual. The Italians did not cling to the tone-scales, as they had come down to them from the Greeks and Romans. The Jewish Christians

added new changes, so that new tone-scales kept arising, which finally were not even determined any more. The popes, Gregory the Great and Sylvester, tried to fix again the old tone-scales for Church music, as well as to determine a few newer tone-scales. Many improvements in the notation of the intervals also arose, the symbols being placed on and between lines, instead of the books previously used. But all this did not satisfy the need for the so-called harmonious singing together, which in those days sounded pleasant; and again, the learning of the many tone-scales was very complicated. It took centuries after the introduction, by Guido d'Arezzo in 1050, of the principles of the present notation before a process was completed by which the present chromatic scale was finally developed from the old tone-scales. From this scale two tone-scales were selected which contained seven tone-intervals within the octave, and which differed from each other only by the fact that either the small or the great third (minor or major) was employed. Besides, this scale, which was composed simply of whole and half tones, in definite succession, could start from any desired one of the twelve half-tones lying within the octave; the difference consisting only in the key note (Ausgangston). All our harmony and melody rest on this system. Who discovered it? It certainly was not invented by one man, and forcibly imposed—the pope himself could not do that! It has developed out of practical need, out of convention (in the previously determined use of the term). For its determination, to be sure, experienced musicians were necessary; a certain fixed definite symbol was needed for each single tone; definite names had to be found for the modes, that is for the keynotes of the scales, definite names for raising and lowering tones, and so forth. History tells of no actual inventor of our present system of music; it has existed only for a little more than two centuries.

I mean that our present system of music, into which we are born, and which we can only with the aid of historical study imagine to be different, has developed just as gradually as our language. Luther did not invent the New High German in his Bible translation (it arose as a compromise between the South German and the Lower German or Platt-deutsch), nor did he force it upon the German nation; but he fixed it as the written language in the most important and most popular book of his time, and this language, greatly enriched by Goethe and Schiller with South German words and phrases, will presently absorb all the dialects, one after the other, simply because it is fixed; it does not on this account remain rigid, but is always absorbing new words and phrases, both from these dialects and foreign tongues, not from any intentional violence (Vergewaltigung) on the part of single writers, but from a certain ever-existing need for more exact terms to describe old and new qualities and occurrences, as well as from a need for variation in sound. We can as little imagine that our present system of tones will change as we can imagine any essential variation in our language. Music without rhythm, without melody and harmony, without a certain conventional regularity, would no longer be for our impressions music, but a concatenation of crying, howling, raging, weeping, groaning, and rejoicing—in the form of shorter or longer interjections. It would be analogous to a relapse from the present imposing regularity to a savage condition, to individualism, to anarchy, to nihilism. Language, like music, is also a work of art; it cannot even be thought without a conventional arrangement of sentences, without a definite regularity of succession and order of the ideas that are to be expressed.

I have adduced all this to support my opinion that our modern music with its development of harmony and melody, and which, as it would seem, could only have reached its present elevation in our modern system of tones, did not develop according to anatomical-physiological laws of nature, and cannot be continued in the mathematico-physical formulas of a Laplace-like genius (Du Bois-Reymond), but arose from individual sensations and impressions and the needs of society and civilization, which, to be sure, have their origin in the important psycho-physical qualities of man and of human society. The physical representations of conditions for our present theory of harmony cannot claim to be more than mathematical attempts to explain the combinations of tones which have already been instinctively found and which affect us pleasantly (consonant) or unpleasantly (dissonant). The uncertain part of this lies in the fact that "pleasant" and "unpleasant" are just as variable qualities of sensations at different times and for different persons as, for instance, are good and bad. As it is, I cannot imagine that the sound of a major third, and still less that of a minor third, should ever have been considered an unpleasant discord (a dissonance), although many centuries ago it may possibly have had that effect on the people of that time, and as regards the number of violations of the upper partials (Schwingungsverhältnisse) expressed in numbers it ought to be so. In art, as a rule, "Whatever pleases is allowable," particularly to those who take an especial delight in the art and make it their own by means of study and practice.

As to the difference of major and minor keys, we at present usually connect with them conventionally the ideas "joyful" and "sad," having in mind, perhaps, the literal meaning of the terms themselves, "hard" (dur) and "soft" (moll). It has always seemed to me that the older dance music and love songs of the French and other civilized nations were generally in a minor key. The minor keys also seem to me to predominate in the folk-songs of the half-civilized Slavic and Hungarian nations, although they are also used for dancing; they also occur in the monotonous songs of Oriental nations. Others have already made the same observations. This has been interpreted to mean that all uncultured nations have a melancholy temperament; that the major key is the "natural" one, partly on account of the rhythmic relations of the fundamental tones, partly on account of the unconsciously heard overtones, which make the major chord. I think this explanation is incorrect. My opinion is that it is easier and requires less exertion of the laryngeal muscles to sing the minor third or sixth than the major; even the

trained singer will admit this. Most persons talk in the minor key, and sing or scream in a major key. In all languages (the monosyllablic ones excepted), the last syllable usually drops into a minor key. When a people begins to sing, it naturally knows nothing about a scale of tones, or a mode (key). But the succession of tones of the existing song recitations must have led principally to a minor key, when tone-scales began to be fixed. Every person speaks usually in one key; in ordinary conversation I speak in D minor, in singing in D major. If I lie quietly on my back and without exertion sing a scale upwards, the following are most convenient for me as a bass-singer: D, E, F, G, A, B, C (Doric); the same hold good when going down the scale. In singing tones which on account of their height require exertion, a little more exertion does not matter; major and minor are, when high, alike in this respect. If therefore the development of the modern chromatic scale is based more on social and conventional causes, the development of major and minor and especially the latter's predominance in the beginnings of music apparently, seems to me to have more purely physiological reasons, namely, the lesser exertion of the laryngeal muscles and the relation to the cadence of words.

The development of arts and sciences, like every development, and every construction, does not proceed by leaps and bounds; every addition, every advance, is linked with something that has gone before. After the chord of three sounds was once felt by many to be one of the most agreeable of harmonics, and accepted as such, the rest developed from it in a tolerably logical order. A mathematical proof that only this trial could please, and that it alone could serve as the conclusion of a system of harmony, cannot be adduced. We can only say that man in the course of his cultural development has developed a pleasure in certain regular relations. This holds true especially for architecture, and here, to be sure, was dependent on purely physical relations, on the empirically found laws of statics. Later that which was originally necessary and useful in the relations of construction became gradually the customary, the agreeable, the beautiful. But there is a great difference between visual and auditory perceptions, and it is a bold idea to think that our organ of hearing measures the agreeable in a consonance of sounds according to the physical causes of its intervals, for instance, the intervals of the octave, as the eye measures an edifice with a standard of length. I cannot grant to acoustics such an unconditionally fundamental importance for the development of music as I accord to statics for architecture: for every combination of tones is possible, but not every kind of combination of building material. I could hardly imagine what one could urge physically and psycho-physiologically against anybody who might claim that for him the combination of C, C sharp, D, or C, D, E, or C, C sharp, D sharp, was most agreeable and was harmony, while on the contrary a triad was very disagreeable. It is only a question, how large a public there is which also feels, or claims to feel this, and which hears pieces composed on the basis of these tone-combinations, which to it are agreeable, with increasing and continually spreading enthusiasm: one cannot furnish a proof that such a music is absolutely impossible and not beautiful. The majority of the public carries the day, and when it is tired of this kind of music, will follow others who offer something else. An analogy may be found in the formation of a sect, which results from the impressions and broodings of a single person, but becomes a wide-spread religion only by the number of those who join it. The impression of the one is, to be sure, a part impression of the whole (Teilempfindung des Ganzen) in a particular form; but why just this form in which it appears should especially please few or many of its contemporaries, cannot be demonstrated either mathematico-physically or psycho-physiologically.

I must finally express my conviction that *the sensation of that which is harmonic is conventional, that it gradually developed in the subject, and is not originally necessary.*[*]

The same holds good for what we now call music. I would not think of maintaining that, before the introduction of the diatonic and chromatic scales there could not have existed any harmony and melody partially agreeable for us. Both of these words are derived from the Greek and already at the time of their first use denoted certain combinations and successions of tones which were agreeable to the ear. It is probably doubtful, however, if we should experience as a pleasant succession of sounds at the present day, all that which the Greeks called melodious (from melos, song). The same holds true of the music of the Middle Ages. Indeed, many of the Protestant chorals, fixed by Luther, intended to be sung by the congregation, and often taken from worldly folk-songs, now hardly give us a melodious impression, nor do the words strike us as poetical. The memory of childhood and of the impressions which the Protestant order of worship made upon the youthful mind, is necessary for a warm appreciation of many of these chorals. As it is, a

[*] An ear-witness (Wittmans, in the "Neue freie Presse") gives the following report of Chinese theater music: "The star, dressed like a prima donna, sings an aria. This indeed is almost more than a European ear can stand. We simply cannot imagine how they can call such a maiming of the voice (Stimmverquetschung) singing. It is in this way that a raven croaks, a cat meows, a door creaks on its hinges, a dry boot-sole squeaks, a pig squeals, a wheel screeches under the brake; thus the Easter rattle of the street gamin resounds, but no human being ever sings in this way. The orchestra, besides, very seldom stops. The representation is almost continuously accompanied melodramatically. Higher dramatic movements are naturally treated more in detail, especially those of battle and conflict. The cymbals whirl, the tom-tom resounds, the whistles scream, the fiddles moan, and all is raging topsy-turvy, and over all the terrible kettle-drum rattles as if madness were wielding the hammer. Not a trace of harmonic combination. Here the genius of discord conspires with all evil music-hating fairies to call into existence a symphony of horrible noises of which we can simply form no conception." The Chinese are the oldest civilized nation, and take the same delight in their music as we in ours. Who is right? Both; we can here form no compromise. Our reporter adds: "In the living presence it (the theater) gives the impression of a senile art that has become childish." Will this also be the end of our theater, of our art?

Catholic would find it hard to accustom himself to the singing in common of all the congregation, just as a Protestant would not appreciate the mass, and the music of masses. Whoever seeks the opportunity of developing himself musically, must live into both these forms of Christian church-music, and will be able to find the melodious in both; it nevertheless requires a sort of historical self-adjustment. What now does the term "Melody" denote for us? One is accustomed to say: "A rhythmically formed succession of tones, which is agreeable to the ear." In general there is no objection to this, and we will now go into the matter a little more deeply.

I have previously pointed out that music developed into a "science of tones" chiefly because it connected itself with such word-thoughts (Wortgedanken) as were rhythmically formed in verses; by this it was bound to a certain form of rhythmic repetition. If one sang the music without words, or played it on an instrument, then one had a rhythmically ordered succession of tones, a "melody," *which probably still bore the traces of speech cadence, but could exist by itself.* Thus arose the regular, absolute music, music without words. I heard in Grosswardein, if I am not mistaken, several czardas, which pleased me very much, played by a somewhat civilized gypsy orchestra; when I found out that they were composed by the first violinist, I asked him if he had had them printed; he answered: "Not yet, I must first look for words for them." Witty persons among the populace not infrequently make new verses for existing well-known dance tunes of a definite rhythm; the improvised quatrains call forth the same enjoyment among the people that improvised couplets do among the audience of a theater. Thus at one time the music comes first, at another the words; that in the beginning, however, the words formed the point of crystallization for the music is my opinion. That the successions of tones, which were rhythmically joined on account of the words and verses, might separate themselves from the words, and gradually become forms which sounded independently of the words and were differently connected, is just as comprehensible as the fact that, later on, new speech-rhythms developed without reference to tones. The forms of the science of tones, when separated from the words, gradually attained a certain degree of independence, and found the *new condition of their development in the new material.* Thus independent instrumental music arose. Its derivation from church music, march music, dance music and work songs, can be plainly recognized in the forms of our modern instrumental music. The suites of Bach are composed of the melodies of dance music: courante, sarabande, pascaglia, gavotte, minuet, gigue. The minuet has maintained its position in sonatas and symphonies down to the present day. Marches, and especially funeral marches, still occur in serious concert music. The rhythms of riding songs, traveling songs, thrashing songs, anvil songs (Schmiede Lieder), sailor songs (when heaving the anchor), spinning songs, harvesting songs, etc., have been derived from the rhythmic movements of the body and are arranged for them. If, indeed, they have not been used for purely instrumental music in exact song form, they have enriched it by means of their various rhythms. Since language is one of the prime factors which affects musical rhythm, it follows that international intercourse, which brought us more frequently into communication with the languages and popular music of other nations, has enriched international music with very many new rhythms; it (music) has taken up the rhythm of the national English, Scandinavian, Italian, Slavic, Hungarian dance-songs and dances.

It will probably be universally admitted that we can conceive of a "melody" only as a rhythmically ordered succession of tones, and that this rhythm arises from different sources. But the above definition of "melody" requires also a succession of tones *pleasant* to the ear. One at once asks: "Pleasant to what ear?" If one answers somewhat like this: "To a musical ear," the question at once arises: "What are the characteristic signs of a musical ear?" We thus get into a circle of questions, from which I find no exit. We do not inquire about rhythm, whether it is unpleasant or pleasant; the most one can say is that a quick rhythmic motion can be disagreeable for us, if we are in a contemplative, quiet mood; it disturbs us or tires us on account of accompanying it, and the like; but a rhythm as such, independent of our moods, does not easily arouse an impression of the beautiful or the ugly. It is different with successions of tones. The series C′, F″ sharp, B′, F‴, and also C, C sharp, F″ sharp, B, give me an unpleasant impression; why? because so pronounced an after-sound (Nachklang) remains in my ear when these tones do not follow one another too quickly, that I experience all four sounds as a combination of sounds, and this combination displeases me. Here, again, we may come back to harmony. In the popular, conventional term of modern music, a tone series seems pleasant, if it moves within the harmonies to which we are accustomed and which therefore have become agreeable to us. Thus we conclude that melody and harmony are most intimately connected. If one recalls any melody that has become popular, one finds it moves within easily scanned, not too variable harmonies and successions of harmonies, which have become customary to us (conventional), and that it finally returns to the key from which it started. This, indeed, constitutes what we usually call the melodious. The number of persons who are sufficiently musical that they can not only sing simple songs together but can also be taught songs in parts, is uncommonly large in the German nation. German-Austrians are especially distinguished in this respect. At St. Gilgem near Salzburg, on the banks of the beautiful Aber lake, where I usually make my summer abode, they have a small chorus and a small wind orchestra; the people take the greatest delight in singing and playing together, and practice new pieces every winter. And yet the village has but twelve hundred inhabitants. Naturally one must not criticise these performances too severely; but the pleasure to be derived from music is sufficient to pay for some little trouble to obtain it. The music of the mass, in which such of the children and grown persons as are suited for it are trained by the

organist and schoolmaster, gives more scope for church music than the singing in unison of the chorals in the Protestant order of worship. The Catholic service also has a powerful effect on the imagination, inasmuch as it draws to its aid music, painting and colored sculptures (for the statues of the Madonna, Christ and the saints are always painted). Hence also are derived influences which permeate the everyday life of the people.

The connection of the rhythmic and the harmonic is probably generally recognized; indeed, to some extent, it is always assumed. Similarly the desire and the striving to multiply the succession of harmonies is intimately connected with the same wish in regard to melody, and this holds good just as far for rhythm as for the succession of tones. The music which we have discussed previously is usually termed popular, because it readily spreads through large masses of society. But this does not satisfy those who feel the need of much music, and who from an innate disposition always think of music, and from inner compulsion must always busy themselves with it. Even in church music, not only as regarded the choir, but also the individual singers, there arose the desire for change, for something new. Men became wearied not only by the successions of harmonies, which finally became tiresome from eternal repetition, but also by the melodies, which always proceeded at the same rate and changed but little in rhythm, and which were originally sung by the tenor, then possibly also by the bass, and finally almost exclusively by all in harmony. Attempts were made to have the voices not always commence and finish at the same time, but to enter gradually, and to let some cease occasionally. Again, the rhythms were divided into smaller parts or enlarged, without bringing about any interruption in the harmony. The latter change led to the so-called polyphony. Each single voice went its own way without disturbing the harmony of the whole; in order to preserve the unity of whole, they came together from time to time, and necessarily, of course, at the end. Thus arose the canon, fugue and other tone forms; music had gained the mastery over words. The new method became popular and underwent further and further extension. The rhythmic element (rhythmic motive), from which polyphony arose, for a while aroused more interest than the harmonic and melodious, indeed such exclusive attention was devoted to it that the harmonic was somewhat neglected, attention being mainly directed to the individual voices. So heedlessly did the composers proceed in this direction that music became more difficult to execute and more removed from the popular style, so that to a certain degree it represented even its antithesis. This led to a return to the predominantly harmonic and melodious. Naturally, in the excessive development of polyphony, the words and the total expression (Gesammtausdruck) of the word-thoughts suffered; the excessive and continuous polyphone treatment of the voices no longer corresponded to the state of mind which was meant to be called forth by the words. This conflict between music and the words, as well as between polyphony and harmonic melody has already lasted for several centuries in the history of music. Hardly had certain concessions been made on each side when both the artist and the public wearied of them, and diverged again until new compromises were once more reached. Since the connection of word-thoughts and tone-expressions (Tongestaltungen) has no natural physical basis, but is purely conventional, this hesitation, how far we should favor the one or the other perception in their simultaneous action (the hearing of the words and thoughts or the hearing of the tones and tone series) will last as long as man speaks and sings at all. Language has developed its own forms for the expression of thoughts and impressions, for the purpose of poetical expression, according to certain conditions inherent in itself. Tone expressions have separated from the words and from song and have also developed into certain forms, into the science of tones, according to certain conditions which exist in the world of tones (Tonwelt). Nevertheless, the conditions under which the greatest effect of poetry and the greatest effect of music are developed are only partially the same; often they heighten each other, not infrequently they stand in complete contrast.

Turning our attention from the connection between tones and words, we may now glance at the development of instrumental music—the so-called absolute music. I can easily imagine that in times past the instrumentalists found it wearisome to always continue with the same rhythm in the conventional harmonies. Each one, therefore, began to make various changes for his own entertainment. So long as only one took this liberty, the innovation could serve to interrupt the monotony very pleasantly. If, however, every quartettist in every bar allowed himself such changes as suited him, in comparison with the conventional harmonic, the general effect would very often be bad. This tendency toward variation in the performance of quartets and symphonies probably lasted longest among the Italians. Thus Spohr in his autobiography[9] speaks with horror of the variations which even the horn players and clarinettists allowed themselves in the accompaniment to one of his violin concerts at Rome. When not carried beyond moderation, however, variation also pleased the greater public, and the composers soon introduced more movement and a regular polyphony into their instrumental works. But the separation of music from words had still another result for the development of instrumental music. The melody was no longer bound to the order of words—it could, therefore, be used also piece-meal, and could be separated into single "motives" (Bewegungsmomente), which could then be utilized more freely; one could put the motives taken from the melodies alongside, over or under each other, and play with them at will harmonically and rhythmically. Indeed, melody in the former coherent form was no longer used; one could work nicely with shorter or longer motives, and then for a change bring in again a finished melody, and so forth. Thus new tone forms arose, based on a purely musical foundation, among which the so-

[9] Vol. I, p. 330.

called sonata form soon gained the upper hand. From Scarlatti and Emanuel Bach down to Brahms it has been developed in many ways. Its essence consists in the change of rhythmic and harmonic motives, in partly predominantly polyphone, partly predominantly melodious development of tone forms. The rich diversity developed in this way in the hands of eminent composers has been striking; besides the sonata forms or even within them the harmonic variation of complete melodies—of a so-called theme—has been developed. One can, to be sure, call this playing with motives, and especially as regards the so-called development in the sonata form, a variation of the same, but this is not so strictly bound to a definitely formed theme. This development of purely musical forms, however, had a strange effect on that which we usually call melody. In polyphone music the attention is so much taken up in the pursuit of the rhythmic movement of the single voices, by the motives, which move away from each other, toward each other, over each other, that the discords which arise in passing are not heard, provided only that harmony sets in again at certain rhythmically important points. We can endure a considerable amount of dissonance, even long continued, provided only we feel in advance, by means of our impressions which are accustomed to the usual succession of harmonies, that consonance must soon set in. As a good instance the long trill on the seventh at the end of the Athalie overture by Mendelssohn may be taken. *The phenomenon that we principally and consciously perceive that upon which we concentrate our whole attention, leaving all else observed physiologically at the same time unnoticed*, is widely extended in the domain of sense-perceptions. Thus most persons have a number of opaque little points in the vitreous humor of the eye, which they do not notice so long as they look at objects and direct their glances at them, whereas they at once perceive them as so-called "mouches volantes," as soon as they unconsciously look in the distance; similarly the after-images in the complementary colors do not disturb us because we do not notice them. The same, however, takes place in purely psychical phenomena. *It is an essential characteristic of the civilized man*, which must be acquired from childhood, to direct, *to concentrate the attention*, the "inner aspect" upon some few concepts, whether they arise directly or are reproduced.

We have previously admitted that the "melodious" consists essentially in the fact that the tone series takes place within accustomed harmonies which do not change too frequently. This conception, however, becomes much more enlarged for the musically educated; he gets accustomed not only to pass over transient discords, but even to feel them to be agreeable or at least "interesting," provided that at the same time he can clearly perceive the most important lines along which the tone masses proceed. If we hear only firm, strong bass notes, and retain them to a certain extent as a melody or theme, it does not matter if we hear at the same time rising or falling diatonic or chromatic scales. Indeed, even series of harmonies existing strong and firm can be made more interesting for us by parallel scales; we do not notice the momentary passing of horrible discords. Take, for example, the introduction to Mozart's "Don Juan" overture. If we designate these scales as a melody, probably no objection can be made, although there is a tradition that Mozart inserted them in the score later on. Chromatic tone series occur so often in melodies and motives, from Bach on to Brahms and Wagner, that we have grown completely accustomed to them; we transfer the rhythmic movement of the tone series (that which one calls in painting the lines or outlines) to the inner point of hearing (physical and psychical) and do not notice that which resounds at the same time.

It would not be very difficult for a good composer to make an interesting musical motive out of the tone series which, as I said before, sound disagreeable to me—the tone series Bach (b, a, c, h) and Aecb (a, e flat, c b) out of which Liszt and Schumann made fugues, do not sound much prettier when heard for the first time—yet after becoming used to them by frequent repetition, one may consider them melodies.[10]

As long as the appearance of transient discords does not pass beyond a certain limit, it entertains and interests us; for that which we conventionally are accustomed to experience as harmonious wearies us, if its effects are continuous and unchanged. But where is this limit of the interesting? How long can we endure the discords and complication of rhythm without having our enjoyment lessened? This cannot be determined, inasmuch as here we have to deal with purely individual, and up to a certain degree, social factors of sensation (Empfindungmomenton, esthetic motives). Much always depends upon how many follow, as disciples of

[10] On the piano, inasmuch as it is difficult to distinguish the various voices of a polyphonic piece on account of the weak sounding (Fortklingen) of tones that are held, and also on account of the same tone timbre of the instrument, harmonic harshnesses are especially emphasized. To play fugues for the piano is very interesting; to simply listen to them affords very problematic enjoyment; the same holds true of other polyphonic music written for the piano, especially of complicated musical compositions arranged for four hands. Well rehearsed polyphonic orchestral and choral music is much easier to understand, because the single voices stand forth better on account of the difference of the tone colors of the various instruments and voices. The fact that difficult music (schwierig zu bewältigende), especially a string quartet, sounds perfectly horrible when played by otherwise practiced dilettanti, is principally due to the uncertainty and timidity with which the tones are sounded and the bow is moved. Therefrom arise so many uncertainties, and so much scratching and scraping is heard alongside of the tones, that much good will and endurance are required to listen to new and complicated music under such conditions. On the piano one plays either correctly or incorrectly; in string music (and also in wind music), there are so many shades of incorrectness which we designate as impurities, that the hearer often does not know what he is hearing, and how it really ought to be. I must also confess that I have seldom heard string quartets, even those composed of the best artists, which at the beginning of a concert sounded absolutely clear to me. Does it depend on the performers or on the fact that the ear in a large room must first accustom itself to the combination of sound from the four string instruments, which is most beautiful in itself?

a so-called new style of composition, that new composer who predominantly pursues the interesting. If he has really found the direction toward which the soul of the musical, or indeed of the unmusical people was striving, then he will gradually find more and more disciples; if he has not found this direction, they will let him go by himself and laugh at him.

Helmholtz expresses that which we have developed in this section in our own fashion, in the following manner, in his classical book:[11] "The amount of harshness which a hearer is inclined to endure as a means of musical expression, depends on his taste and his habits; therefore the boundary between harmony and discord has often undergone changes. In the same manner tone-scales, tone-modes and their modulations have been subject to manifold changes, not only among uncultured and rude peoples but even in those periods of universal history and among those nations, in which the most perfect flowers (Blüthen) of human culture were developed (zum Aufbruch kamen)."

From this follows the conclusion, which is not yet sufficiently impressed upon the minds of our musical theorists and historians, that *the system of tone-scales, of tone-modes, and of the harmonious interweaving of the same does not rest upon immutable laws of nature, but is the result of esthetic principles, which in the progressive development of humanity are subject to change, and will continue to be so in the future.*

Conclusions.

In expressing my personal impressions on Billroth's contribution to the psycho-physiology of music, I may say that it is an admirable attempt and largely a successful one, to blend and harmonize the esthetic aspects of music on the one hand, with the physiologic and physical aspect on the other. That this is a task of exceptional difficulty is proved by the fact that few successful writers on this subject have emanated from the German nation. Helmholtz in his "Sensations of Tone" has emphasized this difficulty. He holds[12] that it is a mistake to make the theory of consonants the essential foundation of the theory of music and insists that the essential basis of music is melody. This is at the outset a confession which affords great comfort to the esthetic worshipers of music. The life and essence of music, therefore, do not depend upon physical, mathematical or physiological facts, but upon melody—a psychological entity. Helmholtz in his well-known work, incurred the enmity of two classes of critics, those of an esthetic or psychological bent, and those of a physical or mathematical leaning. The same experience would have fallen to the lot of Billroth had he lived to see the publication of his book; the fact that the volume was not printed until after his death modified the fierceness of the critics. Nevertheless, a few of them have brought forward the same objections that Helmholtz' work aroused. The Latin proverb *Mortuo leoni et lepores insultant,* (Even hares can insult a dead lion), applies to these critics, but perhaps the best answer to them is found in the work of Helmholtz just quoted: "Harmony has become to Western Europeans during the last three centuries an essential, and, to our present taste, indispensable means of strengthening melodic relations, but finely developed music existed for thousands of years and still exists in ultra-European nations, without any harmony at all. And to my metaphysico-esthetical opponents I must reply, that I cannot think I have undervalued the artistic emotions of the human mind in the Theory of Melodic Construction, by endeavoring to establish the physiological facts on which esthetic feeling is based. But to those who think I have not gone far enough in my physical explanations, I answer, that in the first place a natural philosopher is never bound to construct systems about everything he knows and does not know; and secondly, that I should consider a theory, which claimed to have shown that all the laws of modern Thorough Bass were natural necessities, to stand condemned as having proved too much."

It is true that acoustics constantly employs conceptions and names borrowed from the theory of harmony, and speaks of the "scale," "intervals," "consonances," and so forth; similarly, manuals of Thorough Bass generally begin with a physical chapter which speaks of "the numbers of vibrations," and fixes their "ratios" for the different intervals. But, up to the present time, this apparent connection of acoustics and music has been wholly external, and may be regarded rather as an expression given to the feeling that such a connection must exist, than to its actual formulation. Physical knowledge may indeed have been useful for musical-instrument makers, but for the development and foundation of the theory of harmony it has hitherto been totally barren. And yet the essential facts, within the field here to be explained and turned to account, have been known from the earliest times. There is good evidence for believing that Pythagoras (B. C. 540-510) knew that when strings of different length, but of the same make and subjected to the same tension, were used to give the perfect consonances of the Octave, Fifth, or Fourth, their lengths must be in the ratios of 1 to 2, 2 to 3, or 3 to 4 respectively, and if, as is probable, his knowledge was partly derived from the Egyptian priests, it is impossible to conjecture in what remote antiquity this law was first known.

Concerning the limits of the purely psychical ("rein Psychische") in the perception and interpretation of Music Helmholtz (l. c.) admits that: "Musical esthetics has made unmistakable advances in those points which depend for their solution rather on psychological feeling than on the action of the senses, by introducing the conception of movement in the examination of musical works of art. E. Hanslick, in his book 'On the Beautiful in Music' triumphantly attacked the false standpoint of exaggerated sentimentality, from which it was fashionable to theorize on music, and referred the critic to the simple elements of melodic movement. The esthetic relations for the structure of musical compositions, and the characteristic differences of individual forms of composition,

[11] First edition, p. 358.

[12] Translation by Alex. J. Ellis, Preface, page vii.

are explained more fully in Vischer's 'Esthetics' (Aesthetik). In the inorganic world the kind of motion we see reveals the kind of moving force in action, and as the only final method of recognizing and measuring the elementary powers of nature consists in determining the motions they generate, so it is also for the motions of bodies or of voices which take place under the influence of human feelings. Hence the properties of musical movements which possess a graceful, dallying, heavy, forced, dull, powerful, quiet, or excited character, and so on, chiefly depend on psychological action. In the same way questions relating to the equilibrium of the separate parts of a musical composition, to their development from one another and their connection as one clearly intelligent whole, bear a close analogy to similar questions in architecture. But all such investigations, however fertile they may have been, cannot have been otherwise than imperfect and uncertain, so long as they were without their proper origin and foundation, that is, so long as there was no scientific foundation for their elementary rules relating to the construction of scales, chords, keys and modes, in short, to all that is usually contained in works on 'Thorough Bass.' In this elementary region we have to deal not merely with unfettered artistic inventions, but with the natural power of immediate sensation. Music stands in a much closer connection with pure sensation than any of the other arts. The latter deal rather with what the senses apprehend, that is with the images of outward objects, psychical processes collected from immediate sensation. Poetry aims most distinctly of all at merely exciting the formation of images, by addressing itself especially to imagination and memory, and it is only by subordinate auxiliaries of a more musical kind, such as rhythm, and imitations of sounds, that it appeals to the immediate sensation of hearing. Hence its effects depend mainly on psychical action. The plastic arts, although they make use of the sensation of sight, address the eye almost in the same way as poetry addresses the ear. Their main purpose is to excite in us the image of an external object of determinate form and color. The spectator is essentially intended to interest himself in this image, and enjoy its beauty; not to dwell upon the means by which it was created. It must at least be allowed that the pleasure of a connoisseur or virtuoso in the constructive art shown in a statue or a picture, is not an essential element of artistic enjoyment.

No doubt the ultra physical psychologist would have been more pleased if Billroth had succeeded in localizing a circumscribed area of the cerebral cortex and given experimental and pathological evidence that it was the center for musical apperception, as Broca did for the centre of speech.

But when we are guided into the understanding of the true nature of musical apperception the difficulties in the way towards such an anatomical basis for a cortical musical centre become evident.

The sensation and consciousness of music after all that has been said is something more than "*a psychic process collected from immediate sensation.*" The relation of musical apperception to the sense of hearing is something more intimately psychical than the relation of the senses to the functions of their anatomical end organs (*e. g.*, of the sense of sight to the eye or rather to the retina).

To utilize the comparison of Helmholtz in the introduction to his Sensations of Tone.

"It is only in painting that we find color as an element which is directly appreciated by sensation, without any intervening act of the intellect. On the contrary, in music, the sensations of tone are the material of the art. So far as these sensations are excited in music, we do not create out of them any images of external objects or actions. Again, when in hearing a concerto we recognize one tone as produced by a violin and another by a clarinet, our artistic enjoyment does not depend upon our conception of a violin or clarinet, but solely on our hearing of the tones they produce, whereas the artistic enjoyment resulting from looking at a marble statue does not depend on the white light which it reflects into the eye, but upon the mental image of the beautiful human form which it calls up. In this sense it is clear that music has a more immediate connection with pure sensation than any other of the fine arts, and, consequently, that the theory of the sensations of hearing is destined to play a much more important part in musical esthetics, than, for example, the theory of perspective in painting. Those theories are certainly useful to the artist, as means for attaining the most perfect representation of nature, but they have no part in the artistic effect of his work. In music, on the other hand, no such perfect representation of nature is aimed at; tones and the sensation of tone exist for themselves alone, and produce their effects independently of anything behind them."

Although no such contribution to localization as that of Broca has been made by Billroth in his psycho-physiological aphorisms on music, nevertheless his work will prove of value because of the general clearing of the entire subject of physical and physiological acoustics and by rendering the work of Helmholtz more accessible and more intelligible to musical artists and connoisseurs so that they may hereafter become conversant with the scientific aspect of their art. Above all, by pointing out the gaps and breaks in the experimental and practical logic he has emphasized the gaps that must be filled before we may hope to reach more tangible results concerning the purely psychological aspects of music.

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REPORT ON THE EXAMINATION OF THE EARS OF 440 SCHOOL CHILDREN.

By H. O. Reik, M. D.,

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In November, 1899, I was asked by the principal of a large school in Maryland to take part in an anthropologic investigation which he had instituted among his pupils. My portion of the work was to consist in an examination of the ears, primarily for the purpose of determining the number having defective hearing, and, secondarily, to make measurements of and note defects about the auricle. The general body measurements were made by the director of physical culture, the eyes were examined by an ophthalmologist, the teeth by a dentist, and I incidentally examined the nose and throat because of the frequency with which ear troubles originate in these organs. All of the work was done with considerable care, and I anticipate a complete report from the school which will be of interest to all who are concerned in the management of schools or the general advancement of improved educational methods.

In the report which I am about to present I shall confine my remarks almost entirely to the otologic investigation which proved of great interest to me, of considerable value to some of the pupils, and which, I trust, will be applied to other schools in the future. We all realize the great benefits resulting to the children from the eye examinations conducted in our public schools during the past few years, but up to the present time we have not given the ear its proper consideration. It is almost, if not quite, as important an organ as the eye and the fact that it is not so frequently diseased and that a slight defect, which may be the beginning of serious trouble, is not so readily detected at an early stage by the child or its guardians renders it all the more imperative that it should receive the same watchful care we have inaugurated for the protection of the eye.

The method which I employed in making this examination was quite simple and yet fairly complete. A large room in a quiet portion of the school building was placed at my disposal and a schedule prepared assigning the pupils to definite appointments with me at stated times. With the aid of a small alcohol stove a pan of water was kept constantly boiling and aural and nasal specula, tongue-depressors, etc., were sterilized in every instance before using. The accompanying blanks were used in recording the findings of examination. They were prepared in accordance with my own suggestion and served their purpose fully. Blank A is somewhat more elaborate, in regard to the hearing tests, than would be required in an ordinary examination of school children. Blank B is merely a letter to the parents or guardians of the child, and blank C it will be noticed was prepared solely for scientific purposes and contains nothing that would be of practical value in ordinary school work. After recording the name, age, sex, and the history of any previous trouble with the ears, the external auditory canal and tympanic membranes were examined for evidences of any present or past trouble. Anterior rhinoscopy only was employed in examining the nares, and in looking at the pharynx no instrument was introduced into the mouth except a tongue-depressor. It was thought best to make this part of the examination as simple as possible and submit to its being incomplete, and in a few instances somewhat unsatisfactory, rather than risk any objections from the children or their parents. The tests of hearing were made with as much accuracy as possible without special and elaborate preparation.

I am not at liberty at present to name the school at which this investigation has been conducted, but I may say it is located in one of the largest counties of the State, in a healthy prosperous community which might serve as a good index of the general conditions in this State and the children were in every way a fair average of the children attending Maryland public schools, or, I think I might even say American public schools.

The total number of children examined was 440 and their ages ranged from 3 to 21 years, most of them—378—being between 7 and 17 years old (see table No. 1).

The hearing tests used, as shown by blank A, detected a deficiency of hearing in 45 or almost exactly 10% of the entire number examined. In 13 of these, however, the defect was due simply to accumulation of cerumen in the external auditory canal and could be easily remedied. In the remaining 32 instances the faulty hearing was the result either of former disease of the ear or of present abnormal conditions of the ear, nose or throat which would require the attention of physicians accustomed to deal especially with those organs. Thus, there were 2 cases of chronic otorrhœa; 6 of troublesome adenoid growth in the naso-pharynx; 7 of catarrhal otitis media; 1 obstructed Eustachian tube; 8 showed scar tissue in the tympanic membrane, the result of former inflammatory trouble; 14 had hypertrophied tonsils, and in some of these there was probably also some adenoid growth. Of the purely nasal affections noted there were 13 children with hypertrophied inferior turbinates; 5 deflected septa and 2 nasal spurs. In addition to these, 1 case of bifid uvula and 1 very markedly cleft palate were noted. Of course, a defect of hearing did not invariably accompany an abnormality of the throat or nose, but changes in these organs were recorded whenever they were of sufficient degree to require attention. In the majority of the 45 cases referred to, the loss of hearing was only slight and the prospects of partial or complete restoration under proper treatment would be good.

Here I desire to consider briefly one point which forced itself upon my attention during these examinations, namely:

the normal limit of hearing for high tones. Dench in his work on Diseases of the Ear states that "The normal ear perceives vibrations as musical notes repeated at regular intervals from 16 v. s. to about 32,500 v. s.," and these points "may be called the lower and upper limits of audition respectively." This statement is perhaps generally accepted in so far as the lower tone limit is concerned, but the upper tone limit has not yet been definitely settled. According to Zahn,[1] Sauveur believed that 6400 vibrations constituted the highest perceptible note; Chladin made the number 8192 and Walloston 25,000. "Savart showed that it was possible to hear a sound corresponding to 24,000 vibrations; Despretz was able to obtain sounds whose frequencies were over 36,000 vibrations, and Appunn makes a set of tuning forks, the highest of which is calculated to give 49,152 vibrations per second."

Some years ago Dr. Blake[2] made some very careful observations on this subject, using König rods for the tests and concluded that the perceptive power of hearing high musical tones varies with the age. At about 12 or 13 years of age a tone of 40,960 v. s. was heard 34 feet, while at from 28 to 30 years only tones of 32,768 v. s. were perceptible, and as the age further advanced the limit of perception still further diminished. Preyer and others have obtained similar results.

The instrument most commonly used for determining the upper tone limit is the Galton whistle, and for practical purposes it answers very well, though it is perhaps not so scientifically accurate as the high-pitched tuning forks or the König rods. Working with such a whistle, Bezold made a series of examinations and came to the conclusion that the normal high point of hearing would be registered on the whistle at 1.50. Alderton and others have placed it at 1.25 for children and from that on down to 3. or more for adults.

For some time I have been inclined to consider these points too low for a normal standard. Very frequently have I examined adults who could clearly distinguish a much higher note and I was not, therefore, very greatly surprised to find these young people doing the same. At first I thought the explanation might lie in a hyperacuity of hearing, just as we frequently find children with 20/15 or even 20/10 vision. When at the close of the work, though, I found that the vast majority of those examined had shown a much higher record than the supposed normal, I began to feel a conviction that the standard had been placed too low.

There are a number of difficulties in the way of making accurate tests with the whistle. It is hard to get a large number of individuals to distinguish, with any degree of nicety, between the sharp whistling sound and the accompanying blowing or puffing sound. As this might be especially so of very young children I shall not consider those under 10 years of age, nor shall I include those above that age who evidently did not appreciate the test. Aside from those two classes I have the records of 220 people between 10 and 20 years of age in whom I believe the test was made with a fair degree of accuracy. I may state that the whistle which I used was one made especially for the purpose under the supervision of Dr. B. Alexander Randall of Philadelphia. One perceived the whistle at 1.2; 6 at 1.; 2 at .9; 7 at .8; 41 at .7; 13 at .6; 97 at .5 and the remaining 53 claimed to distinguish it at .3 or .4 of a turn. This would give an average upper tone limit as shown by .6 of a turn on the whistle. The whistle was held from 10 to 12 inches from the ear.

It would be very unwise to draw any conclusions from this examination, inasmuch as the tests were not made with such a purpose in view and hence were not properly guarded and proven, but the evidence is presented because of its suggestive nature and in the hope that it may lead to a discussion which will throw more light on this point than I have been able to obtain from the literature of the subject. If it be anywhere near correct, then the normal limit for high tones is far above 32,000 v. s. or even 49,000 in young persons and many of these can hear over 70,000 and some over 100,000 vibrations per second.

Although not of much practical value one of the most interesting features of the examination was found in the study of the auricles and their peculiarities. Anatomical irregularities and deformities of the auricle have formed the basis of a great many papers and a great deal of consideration has been given to the question of the relation of these markings to the stigmata of degeneration, but as yet very little seems to have been done to determine what constitutes a normal ear. As a natural consequence the recorded aural examinations show no semblance of agreement upon a classification of abnormalities. The most complete classification I have seen is that given by Krauss in his article on "The Stigmata of Degeneration" in the *American Journal of Insanity*, July, 1898, but, as Hrdlicka remarks, in the report of his anthropological investigations, "It should be kept in mind, first of all, that many of the abnormalities of which we shall speak are simply the results of states of malnutrition, or certain pathological conditions, and do not indicate inferiority any more than would a pale skin after a hemorrhage or so many scars after wounds." Hrdlicka conducted a most thorough anthropologic study on 1000 white and colored children in the New York Juvenile Asylum and 100 children in the New York Colored Orphan Asylum, and his report is of extreme interest and great value. In preparing the list of irregularities observed in my examination I have merely elaborated somewhat the same arrangement he used and we may make use of some of the figures for comparison.

Hrdlicka states that "It is a fact, although we have no real statistics on this point, that any of the abnormalities met with in this institution can also be met with occasionally in the children of any class or social position." My slight experience would incline me not only to endorse but to emphasize this statement, for, as may be seen by a comparison of our statistics, I found some of the same abnormalities present in normal, healthy public school children in almost exactly

[1] Sound and Music, p. 83.
Trs. Amer. Ot. Soc., 1872.

the same proportion that he found them among the white children of the Juvenile Asylum.

Before proceeding further I should state that I have accepted and employed as a standard the following description of what constitutes a normal ear: It should be about twice as long as broad and in its attachment to the head should bear an angle of not less than 15 nor more than 30 degrees. It should have a gracefully curved outline, being nowhere pointed or irregular, have a well-defined helix, separated from the antihelix by a distinct scaphoid fossa extending down nearly to the level of the antitragus. The root of the helix should be lost in the concha before reaching the antihelix. The antihelix should not be unduly prominent and should have a well-marked bifurcation at its superior extremity. The lobules should be shapely, not adherent nor too pendulous and free from grooves extending from the scaphoid fossa.

It will be noticed, as might be expected, that the number of abnormalities was much greater among the boys than among the girls, and the difference is especially marked in the varieties of malposition and defects of the helix. This is due no doubt to the rougher life the boys lead and to their manner of applying hats, caps, etc.

The position of the auricle is considered as important as its form development, and the very large percentage of criminals showing such malposition is noteworthy. Thus, in a measurement of over 1000 criminals at Elmira, 72% showed an auriculo-temporal angle of 45 degrees or over and the same condition was found with 57% of the boy criminals at Pontiac, while a large part of the remainder had very close-set auricles (15% or less) which is likewise an abnormality. In my measurements only 0.5% showed an angle of less than 15°, and only 12.5% angles of 45° or more, leaving 87% with ears well placed.

Measurements of the auricle were carefully taken after the system devised, I believe by Bertillon, for the identification of individuals, and, if we separate the boys and girls and then divide each into groups covering periods of 5 years, we find the average measurements to be those given in Table No. 2. It would seem that the auricle gradually increases both in length and width with each year of life up to the twentieth, and I believe others have claimed that this growth continues throughout life. Certainly the most rapid growth is in the earlier years and the annual increase is slight after the fifteenth year. The largest ear measured was possessed by a boy and was 73 mm. long by 40 mm. wide, while the largest girl's ear was not far behind, being 70 mm. long by 40 mm. wide; only one other girl came within 5 mm. of this measurement, but there were five other boys inside that limit.

In 142 of the pupils there were differences, more or less slight, between the right and left ears. In some instances one ear would be larger than the other in every measurement, in some longer than the other but of the same width, or even narrower, and vice versa. In no case did the difference amount to more than 5 mm. The right ear was longer than the left in 62 instances and wider than the left in 75, while the left was longer than the right in 48 and wider than the right in 25. So in most instances when there was a difference, the right was the larger ear.

It will not be necessary to consider the abnormalities of form in detail. Reference to the accompanying table (No. 3) will give their nature and frequency. A few specially marked instances may be worth consideration, however, not only because they represent more or less typical forms of degenerate ears that were seen in children who possessed none of the other stigmata of degeneration. The accompanying photographs were prepared for the stereoscope and lose something of their effect as reproduced.

Fig. 1. A boy, 18 years of age, of good physical development and an unusually bright student; according to his teachers, "One of the best in the school." The auricles are short and broad, 56 by 37 mm., but the auriculo-temporal angle is good. The left auricle shows somewhat better development than the right. The helix is curled in its horizontal portion, but very slightly in the upper part of the vertical portion and bends back on itself, giving the antihelix undue prominence. The concha is large and deep. The antitragus points directly outward, and the lobule is bent back towards the tip of the mastoid process.

Fig. 2. A 15-year old girl, of normal development, both mentally and physically. Left ear slightly larger than the right. The vertical portion of the helix is undeveloped and at its junction with the horizontal portion is a well-marked Darwin tubercle. In this case also the antihelix is made prominent by the bending backward of all the more external portion of the auricle—the helix and scaphoid fossa. The incisor teeth are slightly notched and there is one supernumerary on the left side.

Fig. 3. Boy, 14 years of age; physical examination shows the right shoulder a little high but no curvature of the spine. In school work he is very apt and is considered in many respects quite a genius. The ears are of normal size and position. The vertical portion of the helix is deficient, constituting merely a rim and the scaphoid fossa slopes backward and outward. On the right helix there are two distinct tubercles. The lobules are short and adherent, the inferior margin directly continuous with the cheek. The antihelix is notched just above the antitragus.

Fig. 4. A female, 13 years old, described by her teachers as an "average child, perhaps a little slow mentally." Taken in its entirety the ear is of normal size but some parts of it are overdeveloped, as the antitragus is very large and the lobule is both long and broad.

Fig. 5. A female, 8 years of age, with a good school record. The auriculo-temporal angle is a little less than 15 degrees. The vertical portion of the helix is entirely deficient, and there is practically no lobule. The concha is large and deep.

Fig. 6. A female, 14 years of age, good physical and mental development. There is practically no horizontal portion to the helix, as from the upper anterior portion after a very slight rounding the helix runs obliquely downward and

FIG. 1.

FIG. 4.

FIG. 2.

FIG. 5.

FIG. 3.

FIG. 6.

backward, being also slightly compressed. The antihelix is prominent and the antitragus is broad and flat.

BLANK A. No. .....

RECORD OF EAR EXAMINATION.

Name of Scholar..... .... Date .....
Age..... Sex..... History .....
Condition of External Auditory Canal .....
Condition of M. T..... Eustachian Tube.....
Nares..... Pharynx ..... Hearing .....
Watch R..... L.....
Whisper
Conversational tone R..... L.....
Acoumeter R..... L.....
F. 512 v. s. $\frac{A\ C}{B\ C}$ R..... L.....
Weber F. 256 v. s. R..... L.....
Tone Limits { Upper (Galton) R..... L.....
Lower (Forks) R..... L.....

BLANK C. No. .....

RECORD OF EAR MEASUREMENTS.

Name of Scholar..... Date .....
Age..... Sex..... Size { Length..... Width .....
Position ..... Form .....
Helix ..... Antihelix.....
Tragus..... Antitragus .....
Lobule..... Remarks .....

TABLE I.

NUMBER OF PUPILS EXAMINED, ACCORDING TO THEIR AGES.

	Boys.	Girls.	Total.
3 years of age.....	1	0	1
4 " " "	3	0	3
5 " " "	11	4	15
6 " " "	7	12	19
7 " " "	14	13	27
8 " " "	15	26	41
9 " " "	14	19	33
10 " " "	13	12	25
11 " " "	18	10	28
12 " " "	18	15	33
13 " " "	12	23	35
14 " " "	27	16	43
15 " " "	16	23	39
16 " " "	23	21	44
17 " " "	14	16	30
18 " " "	6	7	13
19 " " "	2	7	9
20 " " "	0	1	1
21 " " "	1	0	1
Total.....	215	225	440

TABLE II.

AVERAGE AURICULAR MEASUREMENTS, EXPRESSED IN MILLIMETERS.

Boys.	Length.	Width.
From 3 to 5 years of age, inclusive.....	57.2	34.8
" 6 " 10 " " " "	60.0	34.8
" 11 " 15 " " " "	62.4	34.9
" 16 " 20 " " " "	63.2	35.2
Girls.		
From 3 to 5 years of age, inclusive.....	52.0	30.0
" 6 " 10 " " " "	56.5	32.3
" 11 " 15 " " " "	59.0	32.4
" 16 " 20 " " " "	59.7	32.5

TABLE III.

ABNORMALITIES OF THE AURICLE.

	Male.	Female.	Total
Number of pupils examined	215	225	440
" showing abnormalities	..	..	113
Both ears abnormal.....	..	..	104
Right ear normal, left abnormal	..	..	6
Left ear normal, right abnormal	..	..	3
Set close to the head; angle less than 15°.	1	2	3
Flaring ears, angle 45°	16	4	20
" " 60°	7	2	9
" " 75°	4	2	6
" " 90°	5	1	6
" upper half only	4	..	4
Upper third bent on itself.....	2	1	3
ABNORMALITIES OF THE HELIX.			
Not well folded	12	6	18
Compressed	8	5	13
Overhanging	9	3	12
Folded over antihelix	1	..	1
Vertical portion undeveloped.....	8	8	16
" " " in upper third.	2	..	2
" " " in lower third.	2	5	7
Lower ⅗ of vertical portion simply a rim.	1	1	2
Upper ⅕ a mere rim, upper ⅗ barely visible	..	1	1
Horizontal portion undeveloped.....	1	1	2
Notched at junction of vertical and horizontal portions.....	5	5	10
Notched at junction and elsewhere.....	..	2	2
Notched on horizontal portion.....	1	..	1
True Darwinian tubercles	5	4	9
Small tubercles on horizontal portion	9	9	18
" " vertical portion.....	5	3	8
Helix continuous to cheek (no lobule)	1	1	2
ABNORMALITIES OF THE ANTIHELIX.			
Very prominent	3	3	6
Obscure	2	1	3
Broad and flat.....	1	..	1
Ends in prominent tubercle	1	1	2
Anterior root undeveloped.....	1	1	2
Posterior " undeveloped.....	2	1	3
Deep furrow between roots	1	1	2
ABNORMALITIES OF THE TRAGUS.			
Bifid	3	..	3
Very broad	..	1	1
Notched	..	1	1
ABNORMALITIES OF ANTITRAGUS.			
Very large	3	2	5
Deficient	1	..	1
ABNORMALITIES OF LOBULE.			
Deficient.....	3	2	5
Very small.....	2	1	3
Very large	3	5	8
Adherent	1	1	2
Thickened and curled upwards.....	1	..	1
Bent back towards mastoid.....	1	..	1
Bifid	..	1	1
Marked by continuation of fossa helicis...	..	1	1

EXPERIMENTAL INJECTION OF TESTICULAR FLUID TO PREVENT THE ATROPHY OF THE PROSTATE GLAND IN DOGS, AFTER REMOVAL OF THE TESTES.

By George Walker, M. D.,

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(From the Anatomical Laboratory of The Johns Hopkins University.)

In order to determine the relationship which exists between the prostate gland and the testes, I have instituted a series of experiments; the first of which I herewith give as a preliminary report.

It is now a well-known fact that the prostate gland undergoes an atrophy after the removal of the testes, and these changes have been most accurately studied by several investigators whose observations I have confirmed, in several instances, for my own satisfaction and instruction. These may be summarized thus: Twelve days after the removal of the testes, there can be seen a beginning change in the epithelial cells of the prostate gland; the protoplasm first begins to clear up; the nuclei lose their chromatin structure and diminish in size. Following this, the protoplasm becomes gradually less and less, and finally at the end of about six weeks it presents only a faint rim around a small, deeply-stained nucleus. The blood-vessels, which at first were large and turgid, very soon begin to shrink, and finally many of them are obliterated; the muscle undergoes fatty degeneration and is ultimately converted into, or replaced by, fibrous tissue. After a period of from eight months to one year, the gland is reduced to about one-fourth its normal size; the glandular structure is represented by only a few small tubules, lined by shrunken and quiescent cells, and the remainder of the gland is converted into fibrous tissue.

In order to ascertain whether the atrophy of the gland is induced by the absence of some substance in the testicular fluid; or in other words, whether there is any element in this fluid which stimulates the prostate and keeps it up to a normal condition, I instituted the following series of experiments: A certain number of well-grown, well-developed and apparently healthy dogs was selected. After a few days' confinement their testes were excised; one-half of these animals were injected with testicular fluid, every other day for five months and eighteen days. The remaining dogs were kept as controls. At the end of the above time, the animals were killed, and the glands taken out and examined.

The testicular fluid was thus prepared: the testes were removed from dogs very soon after they were killed; usually about twenty-five to thirty animals being available at once. The glands after removal were carefully freed from the tunica vaginalis, and the vas; the epididymis, however, was allowed to remain. The organs were then washed with water and ground to a fine pulp; this partially-fluid mass was accurately measured and an equal volume of 50% aqueous solution of glycerine was added. The mixture was then put on ice and allowed to remain for fifteen hours, at the end of which time it was strained several times through a fine cloth. (Repeated attempts were made to pass it through a Pasteur filter, and also through ordinary filtering paper, but so unsuccessfully that the method was discarded.) Thus prepared the testicular extract was a reddish, thick, and slightly tenacious fluid, about the consistency of glycerine. To this was added as a preservative, a small amount of trikresol, dissolved in glycerine, so that the amount of the former represented one-fifth of one per cent of the whole volume; this was not sufficient to impart any odor to the solution. The extract was kept in a wide-mouth bottle, at the ordinary room temperature, for a number of weeks, during which time it remained perfectly pure and free from bacteria. During the course of the injections about 2000 cc. of the extract were used, which represented one hundred and twenty testes.

Ten cubic centimeters of this fluid, which represented five cubic centimeters of the testicular extract were injected into the animals. The injections were begun on the third day after operations, and were made every day during the first ten days. Various parts of the back, loins and thighs were injected. The syringe used was a Parke, Davis antitoxine instrument which was cleaned before and after using by washing in a 1 to 20 solution of carbolic acid. The injections produced very little pain, and were accomplished without difficulty. No attempt was made to shave or to sterilize the skin.

After ten days the dogs became droopy, failed to eat, and were indisposed to play. The injections were stopped for several days, and they rapidly regained their former health. After this, the injections were resumed and continued every alternate day; no further trouble ensued. The uninjected animals were kept in the same place and were fed on the same food, and had in every way the same environment.

At the end of five months and eighteen days the dogs were killed by chloroform; their glands removed, examined macroscopically, and fixed in a solution containing 3% chromic acid and 5% acetic acid, preparatory to making microscopic sections.

The result may be summed up in a few words: The prostate gland in the injected animals presented both macroscopically and microscopically the same changes that had occurred in the uninjected ones. It may be said, therefore, that the injections of the testicular fluid had apparently no effect whatever, and one is probably justified in concluding that the atrophy of the gland is in no way connected with the absence of any substance in the testicular secretion.

A PLEA FOR EARLY NAKED-EYE DIAGNOSIS AND REMOVAL OF THE ENTIRE ORGAN WITH THE NEIGHBORING AREA OF POSSIBLE LYMPHATIC INFECTION IN CANCER OF THE LARYNX.[1]

BY JOHN N. MACKENZIE, M. D.,

Clinical Professor of Laryngology and Rhinology, Johns Hopkins University.

Leaving out of consideration the probable existence of a cancer bacillus and the possible future detection of the disease through the blood and secretions, there remain, in the present state of our knowledge, three principal methods of diagnosis in laryngeal cancer. These are, in the order of their practical usefulness and importance: (1) The naked-eye method, or diagnosis by direct inspection supplemented by clinical phenomena. (2) Thyrotomy, and finally, (3) The microscope. Of the three methods, the second is often included in, and therefore ancillary to the first.

It is impossible to exaggerate the importance of naked-eye diagnosis in the detection of laryngeal cancer. Take it all in all, it is by far the most practical of the three methods. Unfortunately, in most quarters it is relegated to a subsidiary place. Even the best of laryngeal surgeons lose no time in procuring portions of a suspected growth for microscopic examination before they have gone thoroughly into the history of the case and carefully endeavored to make the diagnosis with the naked eye alone.

Every resource and refinement of clinical diagnosis should be resorted to before an appeal to the microscope is made.

As the advanced workers in the field of general surgery have, in the differentiation of tumors, come less and less to seek the counsel of the pathologist, except as a court of the very last resort, so should we teach ourselves to depend more and more upon the naked-eye appearance in the diagnosis of tumors in the windpipe. The removal of the "piece for microscopic examination" too often means only the beginning of the end.

The trained surgeon of to-day discriminates with marvelous accuracy (with the naked eye) between the different varieties of benign and malignant growths and we should cultivate and encourage a like amount of skill in the diagnosis of laryngeal tumors.

But, suppose, after weighing carefully all the facts of the case in our possession, a reasonable doubt remains as to the diagnosis, shall the next step be the removal of a portion of the diseased structure for examination?

In the face of all authority to the contrary, I say, emphatically, "No." Before even considering such a proposition (if it be considered at all), the suspected growth should be examined from every point of view, for in this manner alone can we give the naked-eye method its full measure of usefulness. This is best accomplished by the second method —thyrotomy, or, if necessary, even more extensive external division of the tissues of the neck.

Thyrotomy is justifiable, in such cases, when laryngoscopic examination either leaves reasonable doubt as to its true nature, or manifestly fails to define the exact territory occupied by the disease.

Much can be learned by this method, but it too has its limits of usefulness. For, while it alone may establish with certainty the existence of cancer, it often fails to define with absolute accuracy the whole area covered by the morbid process. We can, therefore, never be perfectly sure, especially in cases in which the cancer appears as a diffuse infiltration, that we have the entire disease before our eyes. For, as I have formerly pointed out, as it is often impossible to indicate with exactness the extent of the trouble laryngoscopically, so after division of the larynx, and even after the removal of the latter organ from the body, it is by no means always possible to map out the entire distribution of the affection.

But suppose, after division of the larynx, there still remains uncertainty as to diagnosis, are we justified under the circumstances and at this stage, in removing a portion of the growth for examination? Or, to make the question still broader, is partial extirpation of the tumor ever admissible even for the purpose of microscopic diagnosis? Only as a measure of the very last resort. Before resorting to thyrotomy in general, especially if a portion of the growth is to be removed for examination, it should be clearly understood beforehand with the patient, that, if the disease should prove to be cancerous, the surgeon shall be at liberty, if in his judgment it seems best, to proceed at once to operation.

The objections which I would urge against removal of tissue for examination (especially when done through the natural passages) are (1) it subjects the patient at once to the dangers of auto-infection at the point of incision and to metastasis elsewhere; (2) it stimulates the local growth of the cancer and (3), finally, the method is often inconclusive, misleading and sometimes practically impossible.

The moment the continuity of the growth is broken, in that very moment is opened the pathway for self-poisoning, and an unfavorable influence is at once exerted on the local process. This is the solemn lesson which I have slowly learned from a sad experience in the past.

Cancer is an infectious process. Whether it be due to a bacillus, which is possible, or whether its activity be due to some vital principle inherent in the cancer cell, incision

[1] Abstract of remarks made in opening the debate on Cancer of the Larynx at the Twenty-second Annual Congress of the American Laryngological Association, May 2, 1900.

through the cancerous mass opens up at once a broad avenue for auto-inoculation. Serum therapy will some day play the most conspicuous rôle in the treatment of this disease.

For, surgical treatment, to be sufficiently radical, involves the sacrifice of so much tissue that the time must surely come when surgery will be supplanted by simpler and more certain means and with the discovery of the agent of infection will come its antidote. But to-day the knife is our only means of cure. How can we best employ it?

The general principle of treatment in cancer of the larynx is sufficiently simple. It is, or should be, identical with that which governs us in the treatment of cancer elsewhere in the organism. Total extirpation, *through liberal portions of healthy tissue*, of the growth, together with the neighboring area of possible lymphatic infection, is the cardinal principle of surgery in the treatment of this disease, for by no other method can it be thoroughly eradicated.

The surgical treatment of laryngeal cancer has resulted in failure in the past because the methods employed have not been sufficiently radical. Thyrotomy with curettage or partial removal, partial and complete removal of the larynx have fallen far short of success simply because they have not completely removed the disease. The records of the future will show that the reason so many cases have terminated in failure and death is because the disease has only been partially removed. As long as we have lymphatics to carry infection and glands to become infected, so long will the patient be subjected to ultimate danger. There is only one rational method, in the majority of cases at least, of dealing with cancer of the larynx. Early total extirpation of the entire organ with its tributary lymphatics and glands, *whether the latter be apparently diseased or not*, is the only possible safeguard against local recurrence or metastasis. By no other method can we give the patient a reasonable assurance of a permanent lease of life.

The surgeon who is abreast with the times does not trifle with cancer in other organs. Why should the larynx be made the exception to the rule? I am told that there are some gynæcologists who still curette the uterus for cancer and some surgeons who still remove half the breast in that disease, but like the Democrats who still vote for Andrew Jackson for President they are becoming every day more and more hopelessly in the minority. We shall have to learn the same lesson here that we are slowly learning in the case of cancer in other parts of the body. It is the same old fight and the same old obstacles will have to be overcome.

It is often impossible by inspection either with the laryngoscope or after preliminary division of the thyroid, by transmission of light or by the sense of touch, to limit the extent of the disease before operation. As I have demonstrated, even after removal of the larynx, the disease may be apparent in one side of the organ and not in the other and yet the microscope show extensive carcinomatous deposit in the seemingly normal side. Especially is this the case in diffuse infiltration or when the epithelioma originates in the deep-seated tissues and does not approach the surface until a late stage of the disease. The loose tissue beneath the mucous membrane in many places and its wealth in lymphatics often favor from a small focus of infection infiltration of other portions of the larynx and sometimes with great rapidity.

Diffuse infiltration, even though confined to a small area, should always awaken suspicion of the existence of the disease elsewhere in the organ, even though no apparent signs of its presence exist.

It is also possible that in its early history, we may find young cancer cells in the lymphatics, as Halsted has demonstrated in the case of cancer of the breast.

In the presence, therefore, of the fact that it is often impossible to limit the diseased area by inspection and the sense of touch, and in the light of the revelations of the microscope, it becomes a serious question whether we accomplish any lasting good by any operation short of complete excision of the larynx and the neighboring lymphatics and glands. Certainly, if the disease approaches the middle line, the imperative necessity of complete removal must be apparent to the most timid and doubting operator.

While total extirpation of the organ with the neighboring area of possible lymphatic infection should be the general rule of practice, are there exceptional cases in which a less radical method of procedure is justifiable?

Early cases in which the growth is very small (as, for example, the small papillomatous and polypoid growths, sometimes found on the cords), distinctly circumscribed, remote from the middle line and not of a specially malignant type may possibly be removed with safety by extirpation of half the larynx and the lymphatics of the corresponding side. Even here success may be due to the fact that while the growth may be pathologically malignant, it may yet be clinically benign. For example, on other mucous membranes of the body (lips, mouth, bladder, etc.), and on the skin, we find such neoplasms in which the microscope shows an epitheliomatous structure in the main body or superficial portions of the growth, but no malignant changes in base or pedicle. It is quite probable that such a condition exists in the larynx. But even in removal of half the larynx and neck lymphatics we can never be perfectly sure that we have removed the entire disease, whilst it is open to doubt whether the preservation of function which may be secured thereby is sufficient to warrant the risk. Partial preservation of function should never be attempted in the presence of the slightest danger to life.

Operations for laryngeal cancer through the mouth, done almost universally to-day, it seems to me, should no longer come within the range of serious consideration.

Thyrotomy with curettement or removal of all apparent (visible) disease is not up-to-date surgery, is in direct defiance of the rules that should govern us in the treatment of cancer, and is a reversion to, and a resurrection of a method of procedure that was discredited and abandoned over half a century ago.

Whatever operation be done, it should be forever borne in

mind that we are dealing with cancer—with an infectious process—that no matter how minute the original point of infection may be, the area of possible poisoning is practically boundless, and that, if the slightest doubt exists as to the circumscription of the growth, the complete operation should be done.

No operation for laryngeal cancer is complete without the removal of the neck lymphatics.

It is chiefly because they have not been complete, that excision of half the larynx or of the whole organ has so signally failed in the past.

The history of the treatment of laryngeal cancer is the same old wretched story of the treatment of cancer in other organs—the long and melancholy record of dismal failure after failure—the inevitable result of only partially removing the disease. What is the present status of the subject? As far as operative measures are concerned, there seems to be utter paralysis of effort—on every side we are confronted by practical failure. Without stopping to inquire how far apparent success in partial removal of laryngeal cancer may be due to mistakes in diagnosis or to the simple accident of good fortune, it is safe to say that in the present state of our knowledge the outlook is extremely unsatisfactory and sombre. In the presence of the great uncertainty that surrounds operations for partial removal and in the light of our experience in the modern treatment of cancer in other organs of the body, shall we resort to complete extirpation of the larynx with the neighboring area of possible infection, or shall we cling with fatuous persistency to what some one has called, with cruel felicity of expression, the "incomplete operation," under which term must be included all surgical procedures hitherto resorted to in this disease?

The time will surely come, if it has not already come, when the conscientious surgeon will consider that he has fallen far short of his duty both to his patient and to himself if he does not, in the treatment of cancer of the larynx, remove not only the entire organ, but also the neighboring lymphatic area. Then and not until then, will we have more favorable statistics and prognosis in cancer of the larynx. Then and not until then, will the medical historian chronicle a real advance in the management of this terrible disorder.

HEREDITY IN DIABETES MELLITUS, WITH A REPORT OF SIX CASES OCCURRING IN A FAMILY.[1]

BY J. HALL PLEASANTS, M. D.

I wish to report six cases of diabetes mellitus occurring among the members of a single family in three generations. The cases are of special interest since they illustrate very well certain features of the hereditary form of diabetes. Five of the six cases have been under personal observation.

Heredity has been long recognized as a factor in the etiology of diabetes, but its importance has been generally underestimated. The first reference to diabetes as a family disease which I am able to find in the literature occurs in Richard Morton's *Opera Medica, Amsterdam, 1696.* In his chapter on diabetes he cites the case of a father and son who suffered from the disease. Among other early writers who called attention to the fact that heredity may sometimes enter, were Blumenbach and Isenflamm. In Rollo's *Cases of Diabetes Mellitus*, 1798, Storer of Nottingham directed attention to what he termed "mild habitual or family diabetes," and cited two families in which several members were diabetic. In one of these cases the father is said to have died of diabetes, while a son, a daughter and a granddaughter suffered from a mild type of the disease. Thomas in the same work reports a similar case. During the present century numerous writers have contributed to our knowledge of the part played by heredity.

Statistics showing the proportion of cases of diabetes in which heredity enters vary considerably, as the following figures, which I have collected, illustrate:

Flint [2]	27.7%
Bouchard [3]	25
Fitz and Joslin [4]	23.8
von Noorden [5]	21.8
Schmitz [6]	21.1
Seegen [7]	14
Naunyn [8]	11.7
Zimmer [9]	10.6
Williamson [10]	10.5
Frerichs [11]	9.75
Grube [12]	7.9
Johns Hopkins Hospital Series (112 cases)	5.3
Wegeli [13] (in children)	2.9

The marked variation in these figures is probably largely due to the class of patients upon which the different statistics are based. Those based upon hospital and dispensary cases are lower, owing to the difficulty in obtaining satisfactory medical histories from such patients. Thus Naunyn [8] reports from his private practice 17-20 per cent of cases giving a history of heredity, while of the patients from his clinic only 4.4 per cent gave such a history. For the same reason the figures based upon an analysis made by Dr. T. B. Futcher and myself of 112 cases treated at the Johns Hopkins Hospital and Dispensary up to June 1, 1900,

[1] Read before the Johns Hopkins Hospital Medical Society, June 4, 1900.

are low. Fitz and Joslin omit cases in which the family history has not been especially inquired into, so that their figures are of especial value. It seems probable that heredity enters in from 20 to 25 per cent of all cases of diabetes.

A study of 60 cases of diabetes in which an hereditary history was obtained, founded upon an analysis of six cases treated at the Johns Hopkins Hospital and upon the series of cases reported by Flint,[15] Fitz and Joslin[16] and Naunyn,[17] shows the occurrence of the disease among other members of the family as follows: father 15, mother 5, brother or sister 21, two sisters 1, brother and sister 4, uncle 7, aunt 3, grandfather 1, father and uncle 1. In two instances several members of the family were affected. One of these is the case reported by Flint in which six members of the family were diabetic. The other instance is that of the family reported in this paper. These figures show the frequency with which the disease occurs in a brother or sister, or in a collateral relation. In only 20 of the 60 cases was one of the parents diabetic. In only 8 of the series were more than two members of the family affected.

While it is comparatively rare to find more than two or three cases occurring among the members of a single family, there are several instances on record in which numerous individuals have been attacked in successive generations. The most remarkable of these is a case reported by von Noorden,[18] who publishes a pedigree of the family in question. In this case the disease affected ten members of a family in four generations, appearing in each successive generation at an earlier age. The family history was further complicated by intermarriages with other diabetic families. Isenflamm[19] reported seven diabetic children in a family. The editor of the *Indian Medical Gazette*[20] cites a case in which eight members of a Hindoo family in three generations are said to have suffered with diabetes. The following cases will be simply referred to: Flint[21] (the case already mentioned), father, paternal uncle, two sisters, and two brothers—only one case recorded and observed. Senator[22]—four children of a Polish Jew. Hertzka[23]—three brothers and a sister. Naunyn[24]—mother and four children. Bence Jones[25]—three brothers and a sister. Mosher[26]—father and mother, three daughters and a grandson. Frew[27]—child nine years old, uncle, aunt and grandfather. These are among the most striking cases which I have been able to collect from the literature and serve to show that diabetes may be at times distinctly a family disease. In many of these cases the writers have had but a single member of the family under observation, the occurrence of the disease among the other members being founded upon hearsay. In this connection attention may be called to the fact that several observers have found that in diabetic families there is often a history of epilepsy, insanity and the various psychoses. Obesity is often a characteristic of diabetic families, occurring in both diabetic and non-diabetic members. Syphilis has also been considered as playing an important rôle—one writer, Schnée,[28] going so far as to say that all cases of hereditary diabetes are due to lues in some ancestor.

The occurrence of diabetes in husband and wife is by no means uncommon, Schmitz[29] reporting 26 cases out of a total of 2320. Although 1.12 per cent seems a large figure, it is the general opinion that such cases of "conjugal diabetes" are accidental, and considering the comparative frequency of diabetes, cannot be regarded as affording evidence, that under these circumstances, the disease is ever contagious.

From a study of the reported cases of diabetes mellitus in which heredity enters and of my own cases, certain peculiar features of the family type of the disease are to be noted.

(1) The occurrence of the disease in an uncle, aunt or cousin, while the parents escape, is very often observed. This may be conveniently spoken of as the "collateral inheritance" of diabetes. In the same way a grandparent may be diabetic while the parent escapes.

(2) When successive generations are affected there is a tendency for the disease to develop at a progressively earlier age.

(3) When more than two members in the same generation are diabetic there is a tendency for the disease to appear at approximately the same period of life.

(4) While hereditary diabetes developing in the first two decades is often of a severe character, the cases developing later in life are generally of a mild type.

(5) In a certain number of cases the disease has appeared in the children prior to its occurrence in the parents.[*]

(6) There is frequently a neuropathic tendency in diabetic families. Cases are recorded in which several children were diabetic, while the others suffered from various psychoses.

(7) Obesity is often a characteristic of families in which diabetes occurs.

The cases which I wish to report to-night occur in two brothers and two sisters, an uncle and a great uncle, as is shown in the accompanying chart-pedigree. With the exception of the great uncle, Heinrich D—— who died in Germany about fifteen years ago all the cases have come under my personal observation. Apart from the diabetic taint the family history shows nothing of especial interest. All of the 23 descendants of the emigrant, Augusta M——, who are now living, are residents of Baltimore. With one exception, I have fortunately been able to make an analysis of the urine of all of these. In addition to these, one member of the family suffering from diabetes recently died at the Johns Hopkins Hospital, so that including Augusta M—— I am thus able to report upon the condition of 24 members of the family. In view of the interest at present attached to the so-called "conjugal diabetes," wherever possible the condition of those persons who have married into the family has been investigated. The result of these inquiries has so far been negative. The average of intelligence in the family is excellent. There is no history of epilepsy, insanity or other nervous trouble. One of the *diabetic* members of the family

[*] Two such cases are reported by Nlessen,[30] Naunyn[31] and Grube[32] each report a case.

—John M—— has, however, had two attacks of delirium tremens. No luetic history is obtainable. Not a single member of the family is stout, but it is of interest to note that the father of the four diabetic brothers and sisters is a very large man, although the diabetic taint comes through the mother.

The following is a summary of the cases:

CASE I. Heinrich D——, the great uncle of Goslar, Germany, is said by his sister to have died of "Zuckerkrankheit" fifteen years ago at the age of forty. Three years before his death he was severely injured by a falling tree. Soon after the injury his general health began to fail. About one year previous to his death sugar was found in the urine. No further details of the case are obtainable.

CASE II. John M—— the uncle—aged 28.

Complains of nervousness.

Past History.—No acute diseases except measles and malaria, the latter two years ago. During the past seven years has suffered much from nervousness brought on, he thinks, by excessive drinking. Has had two attacks of delirium tremens within the past year. No history of lues.

Present Illness.—December 15, 1899, he was examined for admission into a beneficial society, and his urine found to contain sugar. Previous to this he did not know of the existence of diabetes. The examining physician reports to me that on two subsequent occasions sugar in large amounts was found to be present. The classical symptoms of diabetes are not very marked—the patient does not drink a very large amount of water, the urine is but slightly increased in amount, the appetite is moderate and there has been no marked loss in weight. He refuses to submit to a special diet.

Physical Examination.—The patient refuses to allow me to make a physical examination. In appearance he is tall and well developed. Color rather sallow. Seems very much upset about his condition. The examining physician informs me that nothing especial is to be made out in the chest or abdomen.

Urine Analysis.—This has been made by me twice. April 6, 1900: Sugar present, but the amount unfortunately not determined. Specific gravity 1036. No albumin or casts. April 24, 1900: Sugar .4%. Specific gravity 1020. Trace of albumin, no casts. No diabetic, β-oxybutyric acid or acetone present on either occasion. On the whole the case seems to be rather a mild one.

Cases III, IV, V and VI are brothers and sisters.

CASE III. Jacob S—— nephew—aged 20. Tailor by occupation. Came under observation March 30, 1900.

Complains of loss of voice and general weakness.

Past History.—No acute diseases except pneumonia when a child. No luetic history. Habits have always been good. Slight cough with expectoration for several years. One year ago his voice began to become weak and his cough more troublesome. The diagnosis of tuberculous laryngitis was made at the Johns Hopkins Hospital Dispensary, although diabetes was not suspected.

Present Illness.—There is no definite history of onset. About one year ago the patient began to suffer from thirst and dryness of the throat. Drinks a rather large amount of water at times. Frequently voids two or three litres of urine a day. Appetite is large. During the past year there has been considerable loss in strength and weight. There is no pruritus. Now suffers from severe cough and night sweats.

The patient did not know of the existence of diabetes until four or five months ago when he was informed of the fact by his physician. Since then he has been at times on a restricted diet.

Physical Examination.—In appearance the patient is a frail and badly-nourished boy. Very anemic; no zanthomata or other cutaneous lesions; no dryness of the skin; no fruity odor of the breath. The throat examination shows tuberculous ulceration of the larynx. Examination of the lungs shows an advanced tuberculous process in the upper left lobe while there are signs of beginning involvement of the right apex. The physical examination is otherwise negative.

Urine Analysis.—March 29, 1900. Urine shows 2.9% of sugar. No diabetic acid; β-oxybutyric acid or acetone; urine otherwise negative.

CASE IV. Charles S—— nephew—aged 16; clerk. Came under observation March 30, 1900.

Complains of dryness of throat.

Past History.—No acute diseases except measles and chicken-pox; no luetic history; no history of malaria. Habits have always been good.

Present Illness.—The patient says that his general health is good. For the past year he has been troubled with dryness of the throat. Five months ago he had two fingers cut off by machinery. Following this for several days he was very nervous and had a low fever which his physician called "malaria." Since then the dryness of the throat has increased. For the past year he has taken a good deal of water to drink; his appetite has increased and the amount of urine has increased. All these symptoms have become more marked since the accident. He thinks that there has been a slight loss in weight.

The patient was not aware of the existence of diabetes.

Physical Examination.—The patient is a well-developed and well-nourished boy, slightly anemic in appearance. There is no fruity odor of the breath. No zanthomata or other skin lesions; no dryness of the skin. The examination of the throat, thorax and abdomen is negative. Both knee-jerks are absent.

Urine Analysis.—This has been made twice. The patient has not been on a restricted diet. March 29, 1900. Sugar 3.7%; specific gravity 1037; no diabetic acid or β-oxybutyric acid. There is a distinct trace of acetone. Urine otherwise negative. March 31, 1900 (24 hours' specimen); amount in 24 hours, 2050 cc.; sugar 5.3%; specific gravity 1041. No diabetic acid, β-oxybutyric acid or acetone.

CASE V. Augusta S—— niece—aged 16; schoolgirl.

Came under observation April 1, 1900.

There is no complaint about her health.

Past History.—The patient has always been strong and

healthy. Chills and fever every other day when about six years of age. Measles and chicken-pox as a child. The patient is subject to attacks of tonsillitis. She first menstruated five months ago.

Present Illness.—The patient says that she feels strong and well. Her appetite is quite large; drinks a good deal of tea and coffee; does not suffer much from thirst; no dryness of throat; voids between two and three litres of urine a day. The patient does not know how long she has been voiding this much, and has never thought the amount excessive. It is impossible to assign the time of onset of the disease. There is no dryness of the skin, zanthomata or skin eruption. The patient was not aware of the presence of diabetes.

Physical Examination.—The patient is a well-developed and very well-nourished girl. The complexion is brilliant. Lips and mucous membrane are of a good color. There is no fruity odor of breath. There are no zanthomata. An examination of thorax and abdomen is not permitted. Seems in excellent general physical condition.

Urine Analysis.—Two analyses have been made. The patient has not been on a special diet. April 1, 1900: Sugar 1.5%; considerable albumin; no diabetic acid, β-oxybutyric acid or acetone. April 30, 1900: Amount in 24 hours 2600 cc.; sugar 1%; specific gravity 1016. No diabetic acid, β-oxybutyric acid or acetone; trace of albumin.

Case VI. Drucilla S—— niece—aged 10. Schoolgirl.

Admitted to the Johns Hopkins Hospital March 22, 1900 Died April 6, 1900.

Admitted complaining of rheumatism.

Past History.—Measles when six years of age. There have been three previous attacks of rheumatism; no history of malaria.

Present Illness.—For three weeks preceding her admission the patient had been suffering with acute articular rheumatism. She also complained of pain about the heart. Had never noticed that she drank much water or that she voided much urine. Appetite is not large. At times she had pruritus of the scalp. There has been no decrease in strength or weight.

Physical Examination.—The patient is a fairly well-nourished girl. Not anemic in appearance. There are no zanthomata or other cutaneous lesions; no dryness of the skin; odor of breath not fruity. There is considerable tenderness over the involved joints. The heart-dulness is increased, and there is a loud systolic murmur at the apex. A marked friction rub is heard over the body of the heart. Nothing further made out on examination.

After admission to the hospital her condition gradually became worse. She died April 6, 1900, with all the symptoms of cardiac disease. During the greater part of her illness there was considerable fever, often reaching 104°. None of the symptoms of diabetic coma were present at any time. The blood examination did not show the existence of lipæmia. There was a slight reaction with Bremer's test.

The patient was at no time on a diet entirely free from carbohydrates.

Urine Analysis.—During the fifteen days that the patient was under observation in the hospital a very careful daily determination of the sugar, diabetic acid, β-oxybutyric acid, acetone, ammonia and urea was made by Dr. Erlanger. The amount of urine in 24 hours varied from 740 to 2260 cc. The sugar ranged from 1.5 to 4.6%. The specific gravity ranged from 1016 to 1039. At times, diabetic acid, acetone and β-oxybutyric acid were all detected in the urine, the latter on one occasion reaching .35%. The urine towards the last contained a trace of albumin, but no casts.

Autopsy.—Fortunately a post-mortem examination was obtained. The heart showed the presence of a marked endocarditis and a serofibrinous pericarditis. The examination of the abdominal organs showed nothing of importance. The pancreas was possibly slightly enlarged, but microscopical examination revealed nothing abnormal. The liver was practically normal. The brain and cord could not be examined.

An analysis of these six cases brings out certain points of interest which illustrate well some characteristic features of hereditary diabetes. An inspection of the chart-pedigree shows that the disease was probably inherited through the great grandfather Bernhard D——, as he has diabetic descendants through both of his wives, although considering the advanced age at which he died—88—it is improbable that he himself suffered from the disease. The grandmother—Augusta D—— is living and well. Her urine is absolutely negative. The same is true of Theresa S——, the mother of the four diabetic children. These cases thus bring out very well what I have called the "collateral inheritance" of diabetes, there being probably no history of diabetes in an ancestor in three generations at least. The age at which the disease has first made its appearance is a more difficult matter to determine. In the case of the great uncle it was discovered at 40, in the uncle at 28, and in the four nephews and nieces at ages ranging from 10 to 19. We have here the disease appearing in succeeding generations at a progressively early age. In the third generation the disease has appeared approximately at the same period of life; i. e., all the cases are in the second decade. In regard to the severity of the disease in the family under consideration, it is as yet, too early to speak definitely. The cases at present under observation do not seem to be of a severe type, in some of the cases the existence of any trouble being unsuggested. In the one fatal case which I have been able to observe, death was not due to diabetes. As stated previously there is no definite neurotic family history or history of obesity.

The negative evidence which has been brought forward by a study of the urine of 24 out of 25 members of the family, is of interest, and should additional members of the family at a later time develop the disease, will be of importance in determining the time of its onset. If possible the family will be kept under observation and any later developments which may be of interest will be reported.

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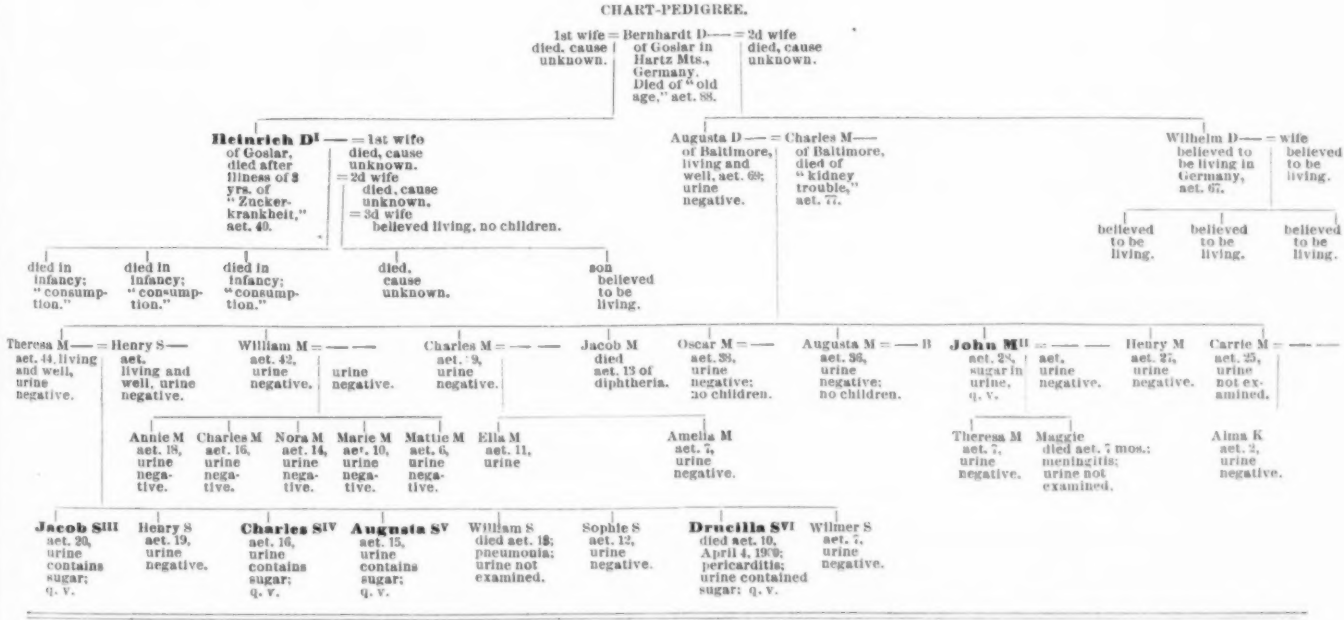
CHART-PEDIGREE.


1st wife = died, cause unknown.
Bernhardt D—— = of Goslar in Hartz Mts., Germany. Died of "old age," aet. 88.
= 2d wife died, cause unknown.
Heinrich DI —— = of Goslar, died after illness of 3 yrs. of "Zuckerkrankheit," aet. 40.
= 1st wife died, cause unknown.
= 2d wife died, cause unknown.
= 3d wife believed living, no children.
Augusta D —— = Charles M—— of Baltimore, living and well, aet. 68; urine negative.
of Baltimore, died of "kidney trouble," aet. 77.
Wilhelm D—— = wife believed to be living. Germany, aet. 67.
believed to be living.
believed to be living.
believed to be living.
died in infancy; "consumption."
died in infancy; "consumption."
died in infancy; "consumption."
died, cause unknown.
son believed to be living.
Theresa M—— = Henry S—— aet. 44, living and well, urine negative.
aet. living and well, urine negative.
William M = —— aet. 42, urine negative.
urine negative.
Charles M = —— aet. 9, urine negative.
Jacob M died aet. 13 of diphtheria.
Oscar M = —— aet. 38, urine negative; no children.
Augusta M = —— B aet. 36, urine negative; no children.
John MII = —— aet. 28, sugar in urine, q. v.
aet. urine negative.
Henry M aet. 25, urine negative.
Carrie M = —— aet. 25, urine not examined.
Annie M aet. 18, urine negative.
Charles M aet. 16, urine negative.
Nora M aet. 14, urine negative.
Marie M aet. 10, urine negative.
Mattie M aet. 6, urine negative.
Ella M aet. 11, urine
Amelia M aet. 7, urine negative.
Theresa M aet. 7, urine negative.
Maggie died aet. 7 mos.; meningitis; urine not examined.
Alma K aet. 2, urine negative.
Jacob SIII aet. 20, urine contains sugar; q. v.
Henry S aet. 19, urine negative.
Charles SIV aet. 16, urine contains sugar; q. v.
Augusta SV aet. 15, urine contains sugar; q. v.
William S died aet. 18; pneumonia; urine not examined.
Sophie S aet. 12, urine negative.
Drucilla SVI died aet. 10, April 4, 1900; pericarditis; urine contained sugar; q. v.
Wilmer S aet. 7, urine negative.

SUMMARIES OR TITLES OF PAPERS BY MEMBERS OF THE HOSPITAL AND MEDICAL SCHOOL STAFF APPEARING ELSEWHERE THAN IN THE BULLETIN.

HOWARD A. KELLY, M. D. The Evolution of My Technique in the Treatment of Fibroid Uterine Tumors. Read before the American Gynæcological Society, at Washington, D. C., May 3, 1900. Published in the *American Journal of Obstetrics*, Sept., 1900. (Illustrated.)

The methods of enucleation in certain difficult cases of myoma uteri by (1) median sagittal bisection of the uterus with the tumors, (2) bisection of the tumor alone or (3) coronal section of the uterus, briefly described in a preliminary report in the JOHNS HOPKINS HOSPITAL BULLETIN for March, 1900, are here described in detail with accompanying explanatory figures.

——— Gynecology, Its Present, Past and Future.—*Philadelphia Medical Journal*, September 22, 1900.

——— Methods of Teaching Gynecology.—*Philadelphia Medical Journal*, September 1, 1900.

——— Resection and Anastomosis of the Divided Ureter. Presented to the Section on Obstetrics and Diseases of Women, at the Fifty-first Annual Meeting of the American Medical Association, Held at Atlantic City, N. J., June 5-8, 1900. Published in *The Journal of the American Medical Association*, October 6, 1900. (Illustrated).

I take it that a urethral anastomosis is about as difficult and as delicate a piece of surgical work as we are called on to execute upon the human body, fully as delicate as the most difficult operation on the eye.

Injuries of the ureter requiring anastomosis are almost ex-

clusively surgical, that is to say, they are produced in the course of operations when they can often be detected at once and immediately repaired. The injury is almost invariably confined to the pelvic portion of the ureter, and if any part is sacrificed the loss is limited to the pelvic end. The injury is, for the most part, involuntary on the part of the operator, as when he cuts a ureter for a blood-vessel or unwittingly picks it up along with the ovarian vessel at the pelvic brim and ligates and divides it there. In other instances it is torn out of the pelvis with an adherent ovarian cyst, myoma, pyosalpinx, extra-uterine pregnancy or tuberculous mass. A voluntary sacrifice is made when the ureter passes through a carcinomatous mass in the broad ligament in caliber." An instrument which Kelly uses to overcome these difficulties, known as a ureteral guide, is then described and the manner of using it is explained. Then follows an abstract of six cases in which anastomosis of the ureter was performed.

ROBERT L. RANDOLPH, M. D. A Review of Recent German Ophthalmic Literature for the Quarter Ending June 30, 1900.—*Annals of Ophthalmology*, July, 1900.

——— An Insurance Case in Which Ossification of the Choroid Led to the Identification of the Body.—*Ophthalmic Record*, July, 1900.

The case was that of a man whose body had lain at the bottom of the Niagara river for nine months. When discovered, the body was so badly decomposed that the insurance companies refused to pay the insurance, claiming that it was impossible to identify the remains. The family, however, remembered that one eye (left) had been blind for years from an injury. The eyes were examined and an ossified choroid in the left eye was the only remaining recognizable structure which was found. This was sufficient to show that the eye had been blind for years and the companies accepted the evidence as conclusive and paid the insurance.

THOMAS R. BROWN, M. D. Poisoning with Snake-Venom.—*Twentieth Century Practice of Medicine*, Vol. XX, pp. 491-538.

In this article the subject of poisoning with snake-venom is considered in full.

The subdivisions of the article treat of the poison-apparatus of the snake and the mode of injecting its venom; varieties of poisonous snakes and their distribution; the properties of snake-venom; chemistry of venom; toxicity of various venoms and causes of variations in toxicity; effect of heat, cold and various reagents upon venom; effects of various digestive ferments upon venom; relation of venom to various other products of albumin hydration; mode of entrance of the venom into the body; mode of elimination of venom; symptomatology; morbid anatomy; physiological and pathological effects of snake-venom, as shown by experiments upon animals; diagnosis; causes of death in snake poisoning; prognosis; prophylaxis; treatment, local and general or constitutional; treatment with antivenomous serum and the production of artificial immunity; immunity of snakes and certain animals; specificity or non-specificity of antivenomous serum; relation between snake-venom and antivenene; treatment of other diseases with snake-venom and antivenene; medico-legal value of antivenene.

Especial attention is paid to the treatment of snake-bite by antivenomous serum or antivenene, while the rôle that this serum has played in establishing our views regarding the relation between toxin and antitoxin is carefully considered.

At the conclusion of the article there is a carefully compiled bibliography of all the important works published on this subject since 1886, Weir Mitchell having furnished a complete bibliography up to that time.

JOSEPH C. BLOODGOOD, M. D. Traumatic Rupture of the Popliteal Artery with Gangrene of the Leg—Amputation—Recovery.—*The Maryland Medical Journal*, September, 1900.

The case was one of dislocation backwards of the right knee-joint, with a subcutaneous complete transverse rupture of the popliteal artery at its bifurcation. The popliteal artery was plugged with a thrombus. There was no hematoma in the popliteal space. Thrombosis of the popliteal vein was diagnosed. Gangrene of the leg began immediately after the injury. The condition of the patient, when admitted three hours after the injury, was one of extreme shock, not associated with great loss of blood. The patient was observed for three days; there was a high temperature (104.8° F.) and a leucocytosis of 8000, due probably to fibrin ferment, as the extravasated blood and gangrenous tissue were sterile. There was amputation through the condyles of femur on the third day, and the patient recovered.

WALTER JONES, M. D. Ueber die Darstellung des Thymins.—*Zeitschrift für physiologische Chemie*, Bd. 29. Heft. 6.

J. H. MASON KNOX, JR., M. D. Compression of the Ureters by Myomata Uteri.—*The American Journal of Obstetrics*, September, 1900.

HENRY J. BERKLEY, M. D. Clinical Cases, VI.—Death from an Unusual Cause in a Case of Dementia Paralytica.—*American Journal of Insanity*, July, 1900.

OTTO G. RAMSAY, M. D. The Surgical Treatment of Primary Renal Tuberculosis, with a Consideration of the Immediate and Remote Results after Operation.—*Annals of Surgery*, October, 1900; *Annals of Gynecology and Pediatry*, June, 1900.

HUGH H. YOUNG, M. D. Suprapubic Retrocystic Extraperitoneal Resection of the Seminal Vesicles, Vasa Deferentia, and Half of the Bladder.—*Annals of Surgery*, October, 1900.

J. WHITRIDGE WILLIAMS, M. D. Teaching Obstetrics.—*Philadelphia Medical Journal*, September 1, 1900.

JOHN J. ABEL, M. D. On the Teaching of Pharmacology, Materia Medica, and Therapeutics in Our Medical Schools.—*Philadelphia Medical Journal*, September 1, 1900.

LEWELLYS F. BARKER, M. D. The Anatomic-Cytological Relationship of the Neurone to Disease of the Nervous System.—*Journal of Nervous and Mental Diseases*, September, 1900.

HUNTER ROBB, M. D. Notes on the Enemata Employed after Abdominal Sections.—*Cleveland Medical Gazette*, September, 1900.

W. W. FORD, M. D. Sarcoma and Cirrhosis of the Liver.—*American Journal of the Medical Sciences*, October, 1900.

WILLIAM E. HUGER, M. D. Report of a Case of Encysted Periurethral Gravel.—*Maryland Medical Journal*, October, 1900.

STEWART PATON, M. D. A Study of the Neurofibrils in the

Ganglion Cells of the Cerebral Cortex.—*Journal of Experimental Medicine*, Vol. V, No. 1.

WILLIAM OSLER, M. D. General Summary of the Cases of Typhoid Fever Treated in the Johns Hopkins Hospital for Ten Years.—*Philadelphia Medical Journal*, October 13, 1900.

——— The Visceral Lesions of the Erythema Group.—*British Journal of Dermatology*, July, 1900.

JESSE W. LAZEAR, M. D. Pathology of Malarial Fevers, Structure of the Parasites and Changes in Tissue.—*Journal of the American Medical Association*, October 13, 1900.

PROCEEDINGS OF SOCIETIES.

THE LAENNEC.—A SOCIETY FOR THE STUDY OF TUBERCULOSIS.

Tuesday, October 30, 1900.

This Society has been organized to systematize and stimulate the work on tuberculosis in the hospital, to educate its members, and to diffuse in the profession and the public a knowledge of the disease. Monthly meetings will be held throughout the session. The programme will consist of a historical review of the great epochs relating to the disease, a critical summary of the conditions relating to tuberculosis in the United States, with a presentation from each of the departments of the hospital of the work on tuberculosis during the first decade, and minor items relating to the symptomatology of the disease. Dr. Osler was elected Chairman of the Society.

I. *Introductory remarks* by the Chairman dealt with the importance of the study of tuberculosis in the profession, and he emphasized the fact that the chief work in the battle with the disease must be done by the general practitioner.

II. *Tuberculosis in the writings of the Fathers to Galen.*—Dr. Osler summarized and read extracts from the writings of Hippocrates, Aretæus, Celsus and Galen. The fairly full knowledge possessed by Hippocrates is indicated by the following statements: He knew that it was the most common of all diseases. He recognized it also as a febrile disease. He mentions its hereditary character. He describes what has been called the phthisical habit of body. He knew the significance of hæmoptysis and its relation to consumption. Many of the clinical features were known accurately—the fever, the cough, the sweats, the diarrhœa, the falling of the hair, the change in the finger tips. He did not know it as a special malady or a specific disease, but it was believed to arise either from an inflammation of the lung which terminated in abscess, or when the pituita or phlegm dropped in large quantities from the head to the lungs and changed into pus, when the blood in a hæmorrhage from the lungs was converted into pus, and, lastly, as a consequence of pleurisy. The contagious nature of the disease is apparently not mentioned by Hippocrates, though it is stated to have been known to his contemporaries, and is referred to by Galen.

The remarkable description by Aretæus of the general features of consumption was then read.

III. *Report on the social and domestic conditions of 190 cases of pulmonary tuberculosis in attendance at the Medical Dispensary of the Johns Hopkins Hospital*, by Miss Adelaide Dutcher.—Two years ago some friends presented the hospital with a sum of money which was to be used in promoting the work on tuberculosis, and it was felt that an important practical help could be given if in every case of tuberculosis applying to the hospital for relief some one would visit the patient's house and give personal instructions as to the mode of life and the care of the sputa. This has been carried out faithfully, first by Miss Epler, and during the present year by Miss Dutcher, who presented a report of the year's work. She divided the cases into three groups—of the whites (exclusive of the Russians), the Russian Jews and the colored. So far as the sanitary surroundings were concerned, the following were the figures:

	Rus.	Bl.	W.
Bad sanitary location	69%	40%	30%
Insufficient light and ventilation	83	71	46
Overcrowding	76	50	46
Personal and household uncleanliness	75	66	43

A full report of the paper will appear in the BULLETIN.

IV. *Suggestions for a Library on Tuberculosis*, by Dr. Welch.—It is proposed, in connection with the tuberculosis fund, to establish a library in which all of the important works on the subject will be gathered. The subject was discussed under the following heads:

1. Historical—the monographs of Waldenburg and Predohl.
2. Epochal works of the first rank.
3. Epochal works of the second rank.
4. General or comprehensive works—ancient and modern.
5. Works and monographs on special aspects of the disease.
6. Tuberculosis of special organs.
7. Transactions of Congresses.
8. Journals devoted to tuberculosis.
9. Records relating to the crusade against tuberculosis.

This paper also will appear in a subsequent number of the BULLETIN, and it will be very helpful to students interested in the disease.

NOTES ON NEW BOOKS.

Bacteriology and Surgical Technique for Nurses. By EMILY M. A. STONEY, Superintendent of the Training School for Nurses, St. Anthony's Hospital, Rock Island, Ill. (*Philadelphia: W. B. Saunders & Co.*, 1900.)

This little volume contains a short and comprehensive account of what is meant by bacteriology. It is hardly to be thought that nurses will know much more than the actual terms used in the description of bacteriological technique; this volume seems to furnish fully as much information as they can appropriate in regard to bacteriology. It is well at least that they should know the relation of bacteriology to disease.

The latter part of the book contains a good account of antiseptics, disinfectants and surgical technique. It is, of course, a compilation, but the knowledge seems to have been judiciously gathered. The information is clearly and concisely given.

Transactions of the Medical Association of Georgia. Fifty-first Annual Session, 1900. (*Atlanta, Ga.: The Franklin Printing and Publishing Company*, 1900.)

This volume, of upwards of 400 pages, contains the usual number of papers read at the meeting of any State Medical Society. Some of them, it is probable, were mainly interesting to the writers, as, for example, "False Gods and Fake Priests of Medicine," or "The Physician the Nation's Guardian." The majority of the papers, however, are upon practical subjects, and many are valuable. One paper, on the "Woodbridge Treatment of Typhoid Fever," is largely polemic in character. It is interesting to notice that the author speaks of using the Woodbridge tablets of various numbers (1, 2, 3) in the multiform complications of the disease. The conception of typhoid fever as an entity which can be combated by routine remedies prepared to order is, to say the least, a singular one at this age of the world. The Medical Association of Georgia is to be praised for the excellent character of most of the work done at the annual session.

The book is well printed. It would have been much improved by a careful, analytical index.

A Book of Detachable Diet Lists.[1] By JEROME B. THOMAS, JR., A. B., M. D., Instructor in Materia Medica, Long Island College Hospital. (*Philadelphia: W. B. Saunders*, 1900.)

Some time since we had occasion to notice the first edition of this book. The second edition has been improved in many ways. The lists presented are sufficiently varied to meet the wants of the sick-room, and the system of detachable slips is a great convenience to the busy practitioner. It is a useful and convenient little book.

Tuberculosis; Its Nature, Prevention, and Treatment, with Special Reference to the Open-air Treatment of Phthisis. By ALFRED HILLIER, B. A., M. D., C. M., Fellow of the Royal Medico-Chirurgical Society, London. (*London, Paris, New York and Melbourne: Cassell & Company, Limited*, 1900.)

This admirable little book should be in the hands of every physician. Although written for conditions existing in England, it is equally valuable for conditions in this country. It gives a detailed and readable account of tuberculosis; its means of transmission from man to man and from animals to man. It also treats clearly of the methods of prevention. It shows that tuberculosis is not inherited, but transmitted; that the disease is not infectious or contagious, in the ordinary sense of the term, but communicable. The plea made for the careful examination of herds of cattle to prevent the sale of contaminated milk, should be listened to in every city, as also the general statement that all milk from suspicious sources should be boiled. In fact, in the light of recent outbreaks of typhoid fever, it is not too much to say that all milk procured in the open market should be boiled before it is used. In no other manner can it be made safe for the consumer.

The chapters on treatment are excellent. Of course the open-air treatment is recommended. The author makes a necessary distinction between living in the open air and needless, reckless exposure to inclement weather. We are glad to see also a protest against the notion that tuberculosis is prevented by hardening children. The rationale of the open-air treatment is very well stated in the following extract: "Pure air cannot destroy the microbe buried in the tissues, but it can so intensify and invigorate the cellular elements of those tissues as to enable them to do so, and this it does not merely by its oxygen or by its comparative freedom from carbonic acid, but by virtue of its freedom from the organic impurities which the respirated air contains, those impurities thrown off among other effete or waste products of combustion within the body through the channel of the expired breath. Provide the cells of the tissues with pure air, a normal requirement, and the fungus, the tubercle bacillus, is either checked or destroyed in its growth upon them. But, on the other hand, as manure an effete animal product, put into land causes the vegetable seed sown in it to flourish; so do these respiratory organic impurities (another form of manure), or effete animal product, reinhaled into the lungs and reabsorbed by the tissues, cause the vegetable fungus, tubercle bacillus, to flourish. Some one has described breathed air, which is saturated with respiratory impurity, as containing air sewage. The term exactly describes the condition, and this sewage constantly bathing the soil or tissues of the consumptive causes the vegetable tubercle bacillus to grow and thrive in them. Cut off the supply, or, in other words, subject the patient to open-air treatment, and the bacillus is starved and checked in its growth."

In the latter part of the book excellent views of sanatoria for consumptives are given. There seems no reason why in every State of the Union similar inexpensive buildings should not be erected for the treatment of consumption. As the author well says, the treatment of consumption is not a matter of latitude or climate, but rather of altitude and dryness of the air.

A Manual of Personal Hygiene. Edited by WALTER L. PYLE, M. D., of Philadelphia. (*Philadelphia: W. B. Saunders & Co.*, 1900.)

The editor does not tell us in his preface for what constituency his book is a candidate. There are many things in the work that are too simple to be meant for the profession, and others that are too professional for the laity. Yet both will find much good common-sense advice as to many matters of personal hygiene. The object of the work is to give "the best means of developing and maintaining physical and mental vigor." There are seven sections contributed by different authors. Dr. Stockton, of Buffalo, writes on the hygiene of the digestive apparatus. In addition to matters of food and drink, the care of the teeth is fully described. Dr. Fox, of New York, writes on the skin and Dr. Ingals, of Chicago, on the respiratory organs. Probably the most valuable chapter is by the author himself on the hygiene of the eye. Sections on the ear by Dr. Randall, on the brain and nervous system by Dr. Courtney, and on exercise by Dr. Stewart complete the book.

Practical Urinalysis and Urinary Diagnosis. By CHARLES W. PURDY, M. D., Chicago. (*F. A. Davis Company*, 1900.)

This is the fifth edition of Dr. Purdy's work and contains much new matter. The amount of work done by the author

[1] Second edition, revised.

on centrifugal analysis is well known, and in this new edition many more data for quantitative determinations by this method are given. These should be of much assistance clinically, as estimations can be made in a comparatively short time. There is an excellent section on the methods of microscopical examination, in which emphasis is put on the characteristics of the so-called false casts. This is an important point, as few works on this subject give more than a brief description of theory, and too often they are mistaken for hyaline casts. Dr. Purdy is to be congratulated on this last edition, which we expect to find as helpful as we have previous ones

Clinical Examination of the Urine, and Urinary Diagnosis. By J. BERGEN OGDEN, M. D., Boston. (*Philadelphia: W. B. Saunders & Co.*, 1900.)

There are so many good works on this subject that the need of another one does not seem very evident, and an author, in presenting a new book, requires to make good his right for recognition. While Dr. Ogden has produced a good book, we doubt if he has furnished a more complete guide to urinary analysis than any single volume yet published, which he states was his aim. The work is divided into two parts, the first dealing with the chemical and microscopical methods of examination, and the second part dealing with urinary diagnosis. The first is much the more satisfactory part of the volume. The tests and methods are clearly described. The first place in the detection of albumin is given to the cold nitric acid test. In the second part of the book the author appears to have gone to very great lengths in making numerous more or less artificial classifications. Thus, under the heading of hyperemia, there are five different conditions described. These complicated divisions are not likely to help the study of kidney disease and urinary diagnosis. In the section on the urine of typhoid fever more than a brief mention might have been given to the question of the occurrence of the bacilli in the urine. The statement that the sediment of typhoid urine "is almost certain to contain . . . a variable quantity of blood, usually a small amount," seems rather a startling one, and it would have been of interest to have had definite statistics given. The majority of writers, in discussing the urine of typhoid fever, fail to note that if large amounts of water be given, as ought to be the case, the classical description of the urine does not hold true. The urine will be abundant and of low specific gravity even early in the disease.

Lectures on Clinical Medicine. By JOHN LINDSAY STEVEN, M. D., Physician to the Glasgow Royal Infirmary. (*Glasgow: Alex. Macdougall*, 1900.)

This volume contains a number of lectures delivered by Dr. Steven in the Glasgow Royal Infirmary. They have previously been published in various periodicals. There are fifteen lectures in the book on various subjects, of which those on Landry's Paralysis, Osteo-arthropathy and Scleroderma are perhaps the most interesting. Some more common clinical problems are also discussed, one lecture being devoted to paracentesis thoracis. The book is interesting, and additional value is given to it by the excellent illustrations.

Atlas and Epitome of Gynecology. By DR. OSKAR SCHAEFFER, Privat-Docent of Obstetrics and Gynecology in the University of Heidelberg. Authorized Translation from the Second Revised and Enlarged German Edition. Edited by Richard C. Norris, A. M., M. D., Surgeon-in-Charge, Preston Retreat, Philadelphia, Pa. (*Philadelphia: W. B. Saunders & Company*, 1900.)

As mentioned by the author in his preface, the book "occupies a position midway between the quiz compend and the more pretentious works on gynecology." The arrangement adopted is different from that usually seen in gynecological works, the contents being considered in the five following groups: I. Anomalies of Formation and Arrested Development. II. Changes of Shape and Position. III. Inflammatory and Nutritional Disturbances. IV. Injuries and their Consequences. V. New Growths.

Group I is short and to the point, and from it the student will gain much information. On page 36 the writer says that passive hyperemia of the endometrium is essential as a cause of "congestive endometritis." Congestion naturally produces a thickening of the endometrium, but in no way institutes an inflammatory process. The causes of sterility as set forth on pages 46 and 47 will be of practical interest not only to the student, but also to the practitioner.

On page 73 the reader is informed that the most frequent causes of uterine displacement are perimetritic and parametritic exudates. Misplacements do certainly occur as a result of inflammatory exudates in the tubes or broad ligaments, but in the great majority of cases the altered position is due to a loss of tone in the uterine supports or to rupture of the perineal body.

The histological drawings are particularly instructive, especially those relating to the endometrium. Figures 2 and 4 on Plate 30 might, however, be justly described as normal endometrium, as the mucosa in the healthy individual often presents precisely the same pictures. The author follows the orthodox but erroneous plan of considering eversion of the cervical mucosa (or an occasional extension downward of the mucosa, lining the cervical canal) as erosion, although he admits that the supposed ulcerative area is covered by "pathologic cylindric epithelium."

Numerous authors speak of a dozen or more varieties of endometritis. In this book the number is reduced to eight. In subsequent volumes the classification will probably become still simpler until all cases can be brought under acute, chronic, and, possibly, polypoid forms.

On page 122 we note with satisfaction the statement that in bimanual examinations of patients suffering from acute salpingitis "the greatest gentleness must be exercised in order to avoid the rupture of an abscess or the destruction of an existing encapsulation." The treatment of acute peritonitis accompanying salpingitis is rather antiquated, but Norris here comes to the rescue with editorial notes, giving recent American treatment.

The author is most patient in his treatment of inflammatory cases, and counsels against the removal of the ovaries except "when persistent treatment for years has failed." It is certainly refreshing to find such a conservative man. This conservatism, however, may be carried too far, as on page 201, where he advocates tapping parovarian cysts. Norris here again gives the appropriate advice—"celiotomy and complete removal should take the place of tapping."

The author says (page 137) that the histological differential diagnosis between tuberculosis of the endometrium and carcinoma of the body "is by no means easy." This is erroneous, as the two processes hardly resemble one another in any particular.

Repair of the peritoneum is considered at some length, and here also we are indebted to Norris for the main features of treatment. In the consideration of complete tears we are told that "the edges of the rectal tear must also be freshened and must be united by suture," but little stress is laid on the essential feature—the careful dissection and suture of the two ends of the muscle.

The diagrammatic drawings (pages 166 and 167) illustrating the various urinary fistulæ are most instructive. The essential features of tubal pregnancy are also carefully dealt with, but we cannot agree with the author when he relies "on absorption" instead of operative means. The best results are to be

obtained where the pregnancy is diagnosed and the tube removed before rupture.

Under new growths (page 185) most polypi springing from the mucosa are said to be due to "circumscribed inflammatory proliferation," when, as a matter of fact, few polypi show any evidence of inflammation except when exposed to outside influences. Under ordinary circumstances they should be considered as partial extrusions from the normal mucosa. Primary carcinoma of a myoma is said to occur (page 204). Such a change in a pure myoma is impossible, as no epithelial elements are present.

The chapter on "Cancer of the Uterus" contains much valuable information and the symptoms are carefully given. Here again the treatment advocated falls far short of the lines indicated by microscopical examination. "If an epitheliomatous papilloma is certainly limited to the cervix, one or both lips of the os and the affected portion of the vaginal vault may be removed." In every case where carcinoma is present the uterus must be removed, as we can never be sure how far the malignant growth has progressed.

The book contains much valuable material, but the new arrangement adopted makes its reading very fragmentary. The labor expended in the preparation of the drawings must have been very great, and rarely have we seen such a valuable collection of gynecological plates. With a more consecutive and somewhat fuller text, which we hope will accompany the next edition, this will be a useful book for both student and practitioner. In the present edition, indeed, the illustrations alone are more than worth the price of the book.

A Text-Book of Diseases of Women. By CHARLES B. PENROSE, M. D., Ph. D. Third Edition, Revised. (*Philadelphia: W. B. Saunders & Co.*, 1900.)

A review of this work is to be found in the Johns Hopkins Hospital Bulletin, Vol. IX, p. 21, where its merits are discussed. That it has been well received is evidenced by a third edition in so short a period. In the present volume a short account of kraurosis vulvæ has been added on page 46, and on page 500 a note wisely advocating saving the tube and ovary when a parovarian cyst is being removed. Apart from these slight additions the book is practically the same.

Cancer of the Uterus. By THOMAS STEPHEN CULLEN, M. B. (Toronto), Associate Professor of Gynecology in the Johns Hopkins University. With Eleven Lithographic Plates and over Three Hundred Colored and Black Illustrations in the Text by MAX BRÖDEL and HERMAN BECKER. (*New York: D. Appleton & Company*, 1900.)

Whenever carcinoma of the uterus has passed from its point of origin, so that the surrounding tissues have become involved, or the adjacent glands are already the seat of metastases, the skill of the most experienced operator can avail nothing as regards a radical cure. Palliative measures alone can be resorted to, the patient, despite all our efforts, finally succumbing to a septicæmia from a terminal infection, a toxæmia from the absorption of poisonous necrotic material or to a uræmia following the blocking of one or both ureters. In view, then, of these constant reminders of our helplessness in dealing with the majority of malignant processes of the uterus, the present work must be regarded as a most welcome addition to medical literature, inasmuch as it not only clearly defines our present position, but also contains a wealth of personal, practical observations, clinical and pathological, as well as a judicious review of the best recent literature dealing with the subject. Briefly, Cullen's book, although not supplying us with a cure for cancer of the uterus, nevertheless, by enlightening us with regard to the most recent progress in the study of the pathology, etiology, treatment and prognosis of such conditions, renders us familiar with the most advanced methods along lines which, in the future, may give a still larger measure of operative success.

As to permanent cure, it suffices to say that at the present time the successful cases are infinitesimally few in number as compared with the overwhelming majority of failures. In view of this fact, we are glad that the author from the very first page has emphasized the necessity of an early diagnosis, pointing out, as is too well known, that the symptoms and signs in these insidious processes are usually meagre. Thus he strenuously advises that in all cases in which the slightest hemorrhage occurs that cannot be satisfactorily explained, an immediate resort to vaginal examination and, as a rule, to a diagnostic curettage, is absolutely necessary. Furthermore, he goes on to say: "It is upon the family physician that we must rely to recognize the early symptoms and to indicate to the patient the appropriate treatment." This necessity for employing every possible means for detecting a malignant growth in its incipiency—at the one stage at which cancer is curable—is enforced again and again by precept and by the records of actual cases.

Following this introduction, which supplies the author with a text, with which all his colleagues must be in complete sympathy, are twenty-six chapters, making in all about 700 pages, dealing with every phase of carcinomatous processes of the uterus, fully illustrated by appropriate cases, which have been followed from the operating-room, through the laboratory to their ultimate termination, so far as could be discovered up to the time at which the book was published.

In Chapter II is found a new and instructive drawing which shows very prettily the anatomical subdivisions of the uterus. It is to be regretted that Peiser's recent research had not met the author's eye before the book went to press. Peiser has called especial attention to a set of lymphatic vessels which curve backwards from the base of the broad ligaments and, after coursing through the uterosacral ligaments, empty their contents into bead-like glands along the sacrum. It seems certain that these lymphatic tracts must play a larger part in the development of pelvic metastases than has hitherto been attributed to them.

Accompanying his description of the normal uterine mucosa, Cullen gives several excellent illustrations of the variations incident to increasing age in women. There is no doubt that ignorance of the normal changes in the endometrium is responsible for many mistakes in diagnosis from curettings, mistakes which have not infrequently brought the pathological method of diagnosis into disrepute in the eyes of the somewhat skeptical clinician. Thus, only recently the reviewer came across a specimen almost identical with that shown in Fig. 13, representing a normal cervical mucosa, which had been diagnosed as an adenocarcinoma. To any student who would avoid such mistakes this chapter is particularly instructive, since Cullen shows us the bizarre appearances of the uterine glands when cut at varying angles to the peculiar invaginations seen in normal glands, which might sometimes prove puzzling at first even to a trained microscopist.

With reference to the acute shedding of the superficial portion of the endometrium at the time of the catamenia, which has hitherto been generally taught, Cullen says: "For six years we have paid especial attention to this point and thus far have always found the mucosa intact throughout the monthly period, there being no loss of substance whatever."

Pursuing the subject in regular sequence, in Chapter III, which deals with the removal and examination of uterine tissue for diagnostic purposes, Cullen gives explicit directions for dilatation and curettage, together with the various methods for preserving tissues so that the best possible specimens for microscopic examination can be obtained. The general practitioner is not expected to have the time, even if he has the training,

for an elaborate study of microscopical specimens, but just as an amateur photographer may take a picture and then leave the development of it to the skilled professional, so the practising physician may curette properly, and later send to a competent pathologist specimens preserved in such a way that they are suitable for study. If Cullen's directions were always carefully followed, there would be fewer reports that the scrapings are insufficient or too unsatisfactory for diagnosis.

In Chapter IV, which deals with squamous-cell carcinoma of the cervix, a classification essentially the same, but differing verbally from that of Winter and Ruge is adopted. On the whole, however, for the sake of avoiding confusion, we think it would have been better if the older classification had been maintained.

The transition of the normal into seriously involved tissue is described in detail and well illustrated by appropriate pictures.

Chapter V gives the various routes of extension. The author's statement, that "if the broad ligament is involved to the extent of being palpable, the patient is doomed," is in accord with the view of Freund and other prominent gynecologists. The fact that the liver is so rarely involved in metastatic processes shows that cancer of the uterus differs from cancer of the breast, inasmuch as, in the latter, an early occurrence of widespread lymphatic metastases is the rule. Hence it is to be hoped that, when an early diagnosis is made, cancer of the uterus may still be strictly localized and readily amenable to treatment.

Chapter VII, in which the various pathological processes which might possibly be compared with carcinoma are dealt with, affords very instructive reading.

In his review of the treatment (Chapter VIII) Cullen mentions, as one of the most important advances in operative procedure, the placing of catheters in the ureters. Werder's operation also is fully detailed and highly commended. The accidents which may occur during operation, especially those performed through the vagina, are discussed. Cullen on the whole inclines to the abdominal, and in this view is in accord with the majority of American operators.

It is to be regretted that the author does not refer to the excision of cancerous tissue by means of the thermocautery, a procedure which has proved very successful in the hands of Dr. T. Byrne of Brooklyn.

Chapters IX to XIII and Chapter XVII deal with adenocarcinoma. Chapter XV is especially valuable as showing that a clinically benign growth may sometimes be associated with malignant disease. Other conditions and deciduoma malignum are discussed at length.

The tabulation of cases studied by Cullen affords much interesting information. It is refreshing to note that while the results, as shown in the table, are most depressing, Cullen hopes for much better results in the near future, since he believes early diagnoses will become much more common. We should be inclined to share in this optimistic view were it not for the fact that in the last week we have encountered three inoperable cases in which the disease had been so insidious that the patients had first complained to their family physician only a few days previous to admission to the hospital.

The various theories dealing with the cause of carcinoma are discussed, but the conclusion is reached that "the etiology is still an unsettled question." Reference is made to inoculation experiments pointing to the possibility of the implantation of carcinomatous tissue on a healthy surface, and the operator is warned to guard against this danger.

The book concludes with an extensive quotation from a paper by G. T. Knowsley Thornton, entitled "A Plea for the Early Diagnosis of Malignant Disease of the Uterus."

While feeling that unstinted praise is due to this magnificent monograph, the reviewer regrets that, as the book is intended for all classes of physicians, the matter has not been arranged somewhat differently. The first half of the book might well have been devoted to an unbroken, epitomized narrative of the author's own work and his conclusions, which might have been followed by his splendid array of illustrative cases. With the present arrangement it is to be feared that not a few readers will fail to extract all the rich meat which the book contains. At the same time it must be said that this defect is one of very few among the many excellences, which have evidently resulted from indefatigable personal research and a thorough understanding of the subject.

The value of the subject-matter has been materially advanced throughout by the excellent original drawings of Messrs. Brödel and Becker, and the author has every reason to be satisfied with the way in which the publishers have presented his work to the public.

BOOKS RECEIVED.

Twentieth Century Practice. An International Encyclopedia of Modern Medical Science by Leading Authorities of Europe and America. Edited by Thomas L. Stedman, M. D. In twenty volumes. Volume XX. Tuberculosis, Yellow Fever, and Miscellaneous. General Index. 1900. 8vo. 906 pages. William Wood and Company, New York.

Metropolitan Asylums Board. Annual Report, 1899. (In two volumes.) Vol. II. Fourteenth Report of the Statistical Committee with Appendices. 1900. 8vo. McCorquodale & Co., Limited, London.

Twenty-sixth Annual Report of the Secretary of the State Board of Health of the State of Michigan, for the fiscal year ending June 30, 1898. By Authority. 1900. 8vo. CXIX + 395 pages. Lansing.

Transactions of the Medical Association of Georgia. Fifty-first annual session, 1900. 8vo. 421 pages. 1900. Published by the Association, Atlanta, Ga.

Selected Essays and Monographs. (From foreign sources). By Various Authors. 1900. 8vo. 306 pages. The New Sydenham Society, London.

Transactions of the American Ophthalmological Society. Thirty-sixth Annual Meeting, Washington, D. C. 1900. 8vo. 200 pages. Published by the Society, Hartford.

Report on the Mortality Records of the Mutual Life Insurance Company, of New York, for Fifty-six Years. From 1843 to 1898. By Elias J. Marsh, M. D., and Granville M. White, M. D. 1900. 4to. 245 pages. The Mutual Life Insurance Company, New York.

Transactions of the American Surgical Association. Volume the eighteenth. Edited by De Forest Willard, M. D., Ph. D. 1900. 8vo. XXVIII + 468 pages. Printed for the Association, Philadelphia.

Transactions of the Louisiana State Medical Society. Twenty-first annual session held at New Orleans, La., April 19, 20, 21; 1900.

Rhinology, Laryngology and Otology and their Significance in General Medicine. By E. P. Friedrich, M. D. Authorized translation from the German. Edited by H. Holbrook Curtis, M. D. 1900. 8vo. 348 pages. W. B. Saunders & Company, Philadelphia and London.

A Manual of Syphilis and the Venereal Diseases. By James Nevins Hyde, A. M., M. D., and Frank Hugh Montgomery, M. D. Second edition, revised and enlarged. 1900. 8vo. 594 pages. W. B. Saunders & Company, Philadelphia.

Studies in the Psychology of Sex. The Evolution of Modesty. The Phenomena of Sexual Periodicity. Auto-Erotism. By Havelock Ellis. 1900. 8vo. 275 pages. The F. A. Davis Company, Philadelphia, New York, Chicago.

A Text-book upon the Pathogenic Bacteria. For students of medicine and physicians. By Joseph McFarland, M. D. Third edition, revised and enlarged. With 142 illustrations. 1900. 8vo. 621 pages. W. B. Saunders & Company, Philadelphia.

A Text-book of the Diseases of Women. By Henry J. Garrigues, A. M., M. D. Third edition, thoroughly revised. With 367 illustrations. 1900. 8vo. 756 pages. W. B. Saunders & Company, Philadelphia.

Bacteriology and Surgical Technique for Nurses. By Emily M. A. Stoney. Illustrated. 1900. 12mo. 190 pages. W. B. Saunders & Company, Philadelphia.

An American Text-book of Physiology. Edited by William H. Howell, Ph. D., M. D. Second edition, revised. Volume I. 1900. 4to. 598 pages. W. B. Saunders & Company, Philadelphia.

A Book of Detachable Diet Lists. For Albuminuria, Anæmia and Debility, Constipation, Diabetes, Diarrhœa, Dyspepsia, Fevers, Gout or Uric Acid Diathesis, Obesity, Tuberculosis, and a Sick-room Dietary. Compiled by Jerome B. Thomas, Jr., A. B., M. D. Second edition, revised. 1900. W. B. Saunders, Philadelphia.

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